

Popular Mechanics

FEBRUARY 1980

\$1.00

**1980 PROJECTION TVs:
THE BRIGHTEST
PICTURE YET!**

**PLUS: One you
make from
a kit**

**NEW CURES
FOR WET
BASEMENTS**

**PM DRIVES 3
NEW VWs: Pickup,
Van & Convertible**

PLUS:

**CROSS-COUNTRY TESTS:
'80 Honda Civic,
VW Rabbit Diesel**

**PM TESTS THE M.I.T.
PEDAL PLANE THAT
ANYONE CAN FLY**

THE TOP 10 NEW BOATS

**PM's attic remodeling:
Full of ideas for you**

**CRAFTSMAN SPECIAL
9 COMPLETE PLANS**

■ **Authentic copy of
Lincoln's office bench**

■ **4 shop tools
you can build**

■ **4 valentine gifts**

OVER THE IRON CURTAIN

**DARING FLIGHT
TO FREEDOM IN A
HOMEMADE BALLOON**





Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

Kings: 17 mg "tar," 1.0 mg nicotine —
100's: 18 mg "tar," 1.1 mg nicotine av. per cigarette, FTC Report May '79

**Come to where the flavor is.
Come to Marlboro Country.**



Marlboro Red or Longhorn 100's—
you get a lot to like.

This One



63XE-UYL-9U99

Some of the best things
are measured by the ounce.



Seagram's V.O.
The symbol of imported luxury. Bottled in Canada.
Enjoy our quality in moderation.

Canadian whisky. A blend of Canada's finest whiskies. 6 years old. 86.8 Proof. Seagram Distillers Co., N.Y.C.



On the cover

A homemade balloon which carried eight members of two East German families to freedom in the West is depicted on its night flight. The full story of the balloon's creation, with sketches by the builders done exclusively for PM, begins on page 100.

—PM painting by Ed Valigursky

Popular Mechanics

FEBRUARY 1980

CONTENTS

VOLUME 153 NUMBER 2

INTERNATIONAL EDITIONS: CARIBBEAN, ITALY, MEXICO, SOUTHERN HEMISPHERE

Special features:

Olympic ski jumpers—human flying machines

Engineering of both the jumper's form and the hill he tries to beat make a spectacular but safe Olympic event.

91

PM drives 3 new VWs

First extensive driving trials for the new Vanagon, plus pickup and convertible models.

98

How to keep your basement dry

PM runs down the best ways to avoid the most common homeowner problem.

163

Testing a pedal plane anyone can fly

M.I.T. biplane design advances human-powered flight technology.

120

Attic remodeling

PM's model project gets the most from an unfinished attic.

134

New projection TVs

Pick 'em for screen brightness, or build your own kit projector.

104

Automobiles and bikes

- 14 Imports and Motorsports
- 35 Saturday Mechanic: How to find, service and replace your car's sensors
- 53 The PM Garage
- 58 Car Clinic
- 62 Detroit Listening Post
- 96 Driving the 1980 VWs
- 108 Driving the 1980 Honda Civic

Electronics, radio and TV

- 9 PM Electronics Monitor
- 20 What to look for in new direct-drive audio gear
- 72 Hints from readers
- 88 Computerized sketch pad you build from a kit
- 104 Get the big picture: Pick of the projection TVs
- 107 Build a giant-screen TV—from kit or scratch

Science and engineering

- 43 Science Worldwide
- 91 The Jump: Anatomy of the top Olympic spectacle
- 92 A human flying machine
- 100 The freedom balloon
- 103 100 ways to beat the border
- 110 Plastic gets tough

Boating and outdoors

- 86 All Outdoors
- 114 PM's pick: 10 boats that are tops for 1980
- 117 Tabs to trim gas use by half
- 119 New gear to go afloat

Every month

- 6 Letters
- 13 Notes from the Editor
- 49 PM Briefs
- 26, 96, 113 It's New Now

Home and yard

- 28 New storm door lets your front door show
- 40 Homeowners' Clinic
- 67 New heat pump lowers your hot-water bill
- 71 Appliance Clinic
- 76 Homebuilt tractor cab takes the bite out of snowblowing
- 78 UL pushes for safer appliance power cords
- 80 Shop-made hardness tester for metalworkers
- 134 How to make room at the top . . . with class
- 163 11 ways water gets into your basement—and how to stop it

Shop and crafts

- 26 New Now for home and shop
- 30 PM looks at handle repair kit
- 32, 54, 85, 72 Hints from readers
- 47 PM Workbench
- 124 4 valentines from your shop
- 126 From Lincoln's law office: A handsome pine and maple bench you can build
- 130 Weekend workshop: 4 great projects for your shop
- 130 Automatic center finder
- 130 Pivotal radial-saw rip fence
- 131 Mobile accessory for tool cabinet
- 133 Rotary punch for neat holes
- 138 Workshop Minicourse: Installing a bandsaw blade

Photography

- 68 Photo Hints
- 122 Six photo mistakes even the pros make—and how to prevent them

Aviation

- 120 What it's like to fly the M.I.T. pedal-powered biplane

AS A SERVICE TO READERS, Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from plans published in this magazine.

POPULAR MECHANICS IS PUBLISHED MONTHLY by The Hearst Corporation, 224 West 57th Street, New York, N.Y. 10019, U.S.A. Subscription Prices: United States and Possessions, \$8.97 for one year; \$16.97 for two years; \$24.97 for three years. Canada and all other countries, add \$4.00 for each year. Second-class postage paid at New York, N.Y., and at additional mailing offices. Authorized as second-class mail by the Post Office Department, Ottawa, and for payment of postage in cash, registered as second-class matter at the Post Office at Mexico D.F., Mexico, June 21, 1950, E 1949 by The Hearst Corporation. All rights reserved. Printed in U.S.A.

POSTMASTER: Please send Form 3579 to Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350.

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of

that order so as to provide the first issue delivery to the Postal Service within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. Should you have any problem with your subscription, please write or call Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. Telephone: (515) 281-5470. State of Iowa residents call (515) 582-1272. To assure quickest service, please enclose your mailing label when writing to us or renewing your subscription. Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Use this address for subscription orders & inquiries

POPULAR MECHANICS
P.O. Box 10064
Des Moines, Iowa 50350

POSTMASTER: Please send Form 3579 to this address

**FOR THE MAN WHO HAS EVERYTHING.
SOMETHING TO CONTROL IT WITH.**



**THE BSR SYSTEM X-10™
THE CONTROLLER**



Just plug it in (no special wiring is needed), and you can control up to 16 lights and appliances

anywhere in the house by simply pressing a few buttons. And when you can turn on the TV, dim the lights or turn them all off without getting up from your easy chair, you're in control.

For under \$90* the BSR System X-10 Starter Kit comes with a command console and enough modules to control lights and appliances at three locations. So the man who has everything doesn't have to have a lot of money to own one.

*Manufacturer's suggested retail price.
BSR (USA) Ltd., Blauvelt, N.Y. 10913
BSR (Canada) Ltd., Toronto, Ont.



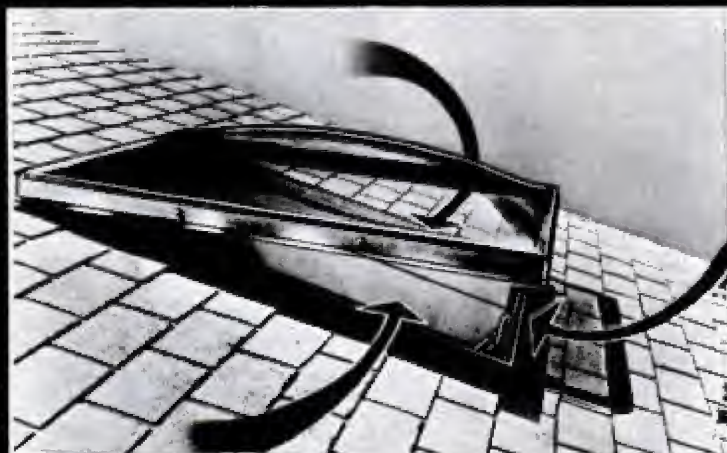
The Controller

EVERYTHING'S UNDER CONTROL. THE BSR SYSTEM X-10.



VENTARAMA

the plastic-domed ventilating skylight



Bring more light and ventilation into your home. . . upstairs bedrooms, inside baths, porches and dark kitchens. Solve the dormer problem. One day installation. Weather-tight and waterproof. Please write or phone for illustrated literature.



VENTARAMA SKYLIGHT CORPORATION
75 Channel Drive, Port Washington, N.Y. 11050 (516) 883-5000

Popular Mechanics®

Editor-in-Chief: John A. Linkletter
Executive Editor: Robin C. Nelson
Managing Editor: Bill Hartford
Art Director: Ira Herrick

Special Editorial Features: Sheldon M. Gallager, editor
Automotive: Bill Hartford, editor; Michael Lamm (West Coast); Gary Witzburg (Detroit)
Science and Engineering: Gurney Williams III, editor
Home and Shop: Harry Wicks, editor; Joseph R. Provey, Penelope Angell, assistants
Boating, Outdoors and Travel: Wm. T. McKeown, editor
Electronics: Neil L. Shapiro, editor
Copy and Production: Garry Winter, chief; John Bostonian Jr., art; Peter Easton, Shannon K. Kelley, Daniel J. Oates, assistants
Art: Don Marinas, technical art director; Douglas Quinn, Alan Andresen, assistants

Special Publications: Clifford B. Hicks

Editorial offices: 224 West 57th St., New York, N.Y. 10019. We cannot be responsible for loss of unsolicited queries, manuscripts, or photos. For return, they must be accompanied by adequate postage.

Bureau of Information: Sophie Gronowicz, director; 224 West 57th St., New York, N.Y. 10019. (212) 262-4292

**Associate Publisher,
Director of Advertising**
Daniel J. Coleman

Advertising Offices:
New York: 224 West 57th St., New York, N.Y. 10019; (212) 262-4284
Chicago: 520 North Michigan Ave., Chicago, Ill. 60611; (312) 527-2400
Detroit: 377 Fisher Rd., Grosse Pointe, Mich. 48230; (313) 881-3520
Cleveland: 221 Mercantile Center, 3659 Green Rd., Cleveland, Ohio 44122; (216) 292-7334
Los Angeles: 460 East Carson Plaza Dr., Carson, Calif. 90746; (213) 532-8101

Production Manager: John A. Ragina, (212) 262-4900
Classified Advertising Manager: H. E. Kappel, (212) 262-4825

Published by The Hearst Corporation
President

Frank A. Bennack Jr.

Chairman

Randolph A. Hearst

Vice Chairman

John R. Miller

President, Magazines Division

Gilbert C. Maurer

Publisher, Popular Mechanics

Joseph F. Kern

Publishing Consultant

Richard E. Deems

POPULAR MECHANICS IS PUBLISHED MONTHLY by the Hearst Corporation, 959 Eighth Avenue, New York, N.Y. 10019. U.S.A. Frank A. Bennack Jr., President; Randolph A. Hearst, Chairman; Harrison A. Minick, Treasurer; Harvey L. Lipton, Vice President and Secretary. Hearst Magazines Division: Gilbert C. Maurer, President; K. Robert Brink, Executive Vice President and General Manager; Raymond J. Petersen, Executive Vice President, Advertising; Thomas J. Hughes, Resident Controller; William S. Campbell, Vice President, Director of Circulation; Joseph F. Kern, Vice President for Popular Mechanics.

BEHIND THE GENIUS OF OLYMPUS CAMERAS IS A GENIUS.



Maitani

When he was ten he built his first camera. By the time he was a university student, he had four important camera patents to his credit.

His Name: Maitani. Chief camera designer for the Olympus Optical Company.

And without exaggeration, he is responsible for the 35mm SLR as we know it today.

Before Maitani got his hands on it, the 35mm SLR was a lumpy, leaden affair. Maitani took the camera and five years later transformed it into the light, compact, unexpectedly rugged Olympus OM 1.

Amazingly, as the camera shrunk, the critical features got larger. The viewfinder: big, bold and bright. The controls: roomy. The shutter release: designed with the forefinger in mind.

This was accomplished through the use of new materials. New design. And commanding it all: the startling vision of a true inventor.

Next came the OM-2. With an OM-1 actually built into it, the OM-2 goes on to offer a fully automatic function.

The OM 2 can measure the light during the actual instant of exposure.

For those who want to enter the world of 35mm SLR photography in the least intimidating manner, Maitani has created the Olympus OM-10. A fully automatic camera that lets you just focus, and shoot. And it's built with the Olympus quest for quality.

Yet there are those who maintain that Maitani's greatest contribution has been the OM System. A group of over 300 components that are as compact as the cameras themselves. Imagine, if you will, a 300mm lens you can hand hold! Pick up an Olympus camera. Is there not something in the feel, the heft, the lightness and toughness that sets it apart?

Long before these cameras were made, Maitani sculpted them in clay. And in wood. Thousands of hands from all over the world were studied for their size and shape. The devotion to detail can be documented in dozens of ways.

The Olympus OM-1, OM-2, OM-10. We can honestly say that few things in the world are designed and made this well.

And we can honestly say that no one else in the world could have designed and made them.

For information write Olympus, Woodbury, N.Y. 11797

OLYMPUS ANNIVERSARY



OLYMPUS®

LETTERS TO THE EDITOR

Up a tree

The October PM arrived exactly one week after Hurricane Frederic devastated Mobile, Ala., and I couldn't have been more relieved to see the article on tough cuts (*How to Make the Tough Cuts with Your Chain Saw*, page 126). With over 20 large pine trees either broken, uprooted or toppled, I was able to do the necessary tree work safely.

One problem in the article was the artist's drawings of the Treeman's knot on page 127 (figures 2 and 3). Shouldn't the tail from the waist loop wrap three times around the main tail and then pass between, not behind, the waist loop and the main tail rope?

DAVID B. DABNEY
MOBILE, ALA.

Here in the Northeast, the standard tree-climbing rope is 1/2-in. dia. by 120 ft. long in manila. Anything larger is just too bulky to handle safely in a tree.

The power-saw rope should be put as high as the climber's safety line and in the tree's center. That way, you can reach either side of the tree easily.

Since I have been in the tree-work business for 18 years, I enjoyed this article very much.

LOYAL L. AVERY III
WAKEFIELD, MASS.

Never, never use a limb as a crotch for securing your safety rope. Pass the climbing rope around the main trunk—and use the limb only as a "stop."

R.G. CARMICHAEL
BETTENDORF, IOWA

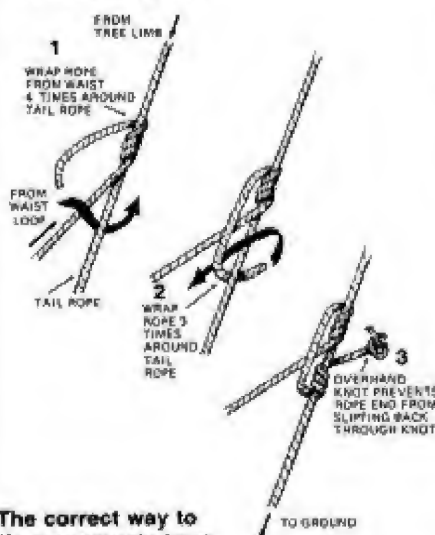
The technique shown on page 128 for pulling a limb clear of a building only shows a small part of this complex operation. Three bull ropes are needed to be tied to this one branch to safely maneuver the branch clear of the building. This maneuver requires the use of two or three ground men.

It takes years of experience to become a competent tree climber. . . If your readers attempt to remove a tree without proper equipment, knowledge and skill, they could possibly cause themselves serious injury.

JAMES EVANS, PRESIDENT
MUNICIPAL ARBORISTS ASSN.
STATE COLLEGE, PA.

Felling nuisance limbs is a hazardous task. We did not mean to leave our readers with the impression that it should be attempted without learning the skills beforehand. We'd like to

TREEMAN'S KNOT



The correct way to tie a treeman's knot.

thank the readers who wrote with additional tips and cautions—and also for calling our attention to the artist's mistake on page 127 (figures 2 and 3). The diagrams above show the correct steps for tying a treeman's knot, properly called a taut-line hitch.

Refreshing

The article on NASA's energy-conserving home (*Our Year in NASA's Far-Out House*, page 77, June '79) was one of the best I've read on the subject. Energy-efficient living has indeed become a necessary condition of future survival. It's refreshing to see that PM is as concerned with environmental problems as it is in sharing helpful hints from its readers. Keep up the good work.

J.E. POPOLIS
BELLEFONTE, PA.

Cone caveat

Firewood: The Born-Again Fuel in the September PM (page 125) did not make clear that the use of a cone-shaped splitter on a car equipped with a limited-slip differential is a highly dangerous procedure.

W. BERNHEIM
OROVILLE, GA.

A cone-shaped splitter should never be used on a car equipped with lim-

ited-slip if the opposite wheel is on the ground. A person buys a car equipped with Positraction (or any other kind of differential lock) so that power will be applied to both rear wheels equally. This option will prevent the drive wheel from turning freely and could easily cause the car to jump the jack.

Owners of the cone-type splitters should read their manuals thoroughly before attempting to use the device. Install the emergency stop-button as directed.

A missing engine

The article *PM Follow-Up: The DC-10* (PM Briefs, page 73, Oct. '79), regarding breakaway engines from wide-body jets, reminded me of an incident that occurred in 1971 or 1972.

An Air Force C-5A at Altus AFB, Okla., was running up its engines prior to takeoff. When takeoff thrust was reached, one of the outboard engines separated from the pylon, "flew" up and back over the wing, and finally landed in a field about half a mile away! To my knowledge, it did not strike the empennage (tail section). The Air Force probably will not want to admit to this incident, but perhaps other readers can supply more details. As a pilot, I appreciate your coverage of aviation safety topics.

E.S. SUMMERFIELD
(FORMER) CAPT., USAF
HIGHLAND, CALIF.

Down-under devotee

I enjoyed your spread on the latest small computers (*Home Computers That Plug In and Go!*, page 66, Aug. '79).

In this country, all the most recent developments and technical information are slow to filter through to the average person. I'm thankful that PM allows me to keep my finger on the world pulse of inventions and innovative products.

MURRAY SMITH
AUSTRALIA

Correction

On page 106 of the article *Auxiliary Heaters Put Heat Where You Need It* (Dec. '79), the price given for Gold Bond's Panelectric ceiling panels was incorrect. Installed in a finished ceiling, the price is approximately \$1 per sq. ft. The panels alone are about 70 cents per sq. ft.

PM



OMC TURNING SOLD ME.

Visiting new harbors with Jeanne and the kids . . . that's where I find my fun.

But sometimes things can get a little crowded. That's why I insisted on OMC for our new boat.

It all started when I used a friend's boat with an OMC. *It let me turn in about half the distance of any stern drive boat I ever handled.*

My dealer explained the reason . . . OMC Turning™. Other stern drives pivot 60° side to side. The OMC Stern Drive pivots up to 90° for tighter turns and more maneuverability.

So, my OMC really makes the difference—especially in

close quarters.

OMC Turning sold me. It could sell you, too.

You could also be sold on OMC's fingertip-controlled SelectTrim™ for pulling a skier or planing out with a boatfull. Or, have the boatbuilder install Pre-

OMC makes the difference.

OMC STERN DRIVE

OMC STERN DRIVE
A PRODUCT GROUP OF OUTBOARD MARINE CORPORATION
3145 CENTRAL AVENUE, WAUKEGAN, ILLINOIS 60085
FROM THE MAKERS OF EVINRUDE AND JOHNSON

set Trim™ for best overall performance.

And if you trailer a lot you'll want our exclusive 75° Hi-Tilt™. Easy in and easy out with 25% more clearance whether launching or changing a prop in the water.

OMC also offers you Tru-Course®, power or mechanical, steering that never "fights back" and Uni-Mount™ for less noise, vibration, and a more relaxed ride.

Ask an OMC owner. Write us for more information and go see your dealer. He's in the Yellow Pages under "Boats".

Then specify total performance. Specify OMC.

© 1979 Outboard Marine Corporation
Manufactured in the U.S.A.

INTRODUCING A YAMAHA WITH THREE WHEELS AND A DOZEN ADVANTAGES.

When we say our brand-new Yamaha Tri Moto will out-pull, out-run and out-fun anything in its class, we've got our reasons:



1 For one, it's a nearly indestructible workhorse able to perform just about any job in anything from fresh plowed fields to sloppy mud and hardpack snow.

2 For another, it's a quick, responsive recreational vehicle, capable of taking you up mountains, down valleys, even through swamps (if that's your idea of a good time).

3 At the heart of this versatile machine is a 123cc two-stroke engine that gushes power and torque like an oil well. Rugged, reliable and simple, as only a two-stroke can be.

4 And Yamaha's Autolube system relieves you of the responsibility and mess of pre-mixing the gas and oil, while maintaining the ideal oil/fuel mixture for longer engine life. There's even an oil reservoir light to tell you when it's finally time to fill 'er up.

5 The transmission, kicked into life by an automatic centrifugal clutch, has five foot-operated forward speeds, including an ultra low with

tremendous pulling power. (Although it's not recommended, a Tri Moto has been known to pull a two-ton Chevy—with the Chevy's brake on.)

6 A Capacitor Discharge Ignition means not only maximum performance and efficiency, but no breaker points to wear out or adjust.

7 The riding position on a Tri Moto is the direct result of our unique seat and frame design. The benefit is remarkable stability for a three-wheeler, even running side hill.

8 Up hill or down, the specially designed front fender keeps mud from accumulating on the underside.

9 Big, fat, cord-type tires provide amazing traction over terrain that would bog down lesser three-wheelers. They're also tougher to cut than low-pressure balloon-type tires.

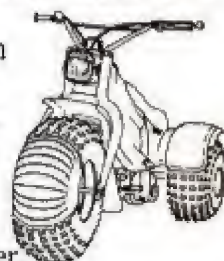
10 There's a disc brake in the rear for plenty of fade-free stopping power.

11 And an ingeniously engineered system waterproofs the air cleaner and carburetor. Just one more example of perhaps the best advantage of all.

12 It's a Yamaha.

YAMAHA

When you know how they're built.



PM ELECTRONICS MONITOR

Hey, now I remember!

Calculators have evolved beyond being mute mathematicians for adding up the grocery receipts. Now they can function as a pocket-size memory for important dates, phone numbers and even messages.

Sharp and Toshiba have both announced alphanumeric calculators. Sharp calls its EL-6200 an "executive planner" and Toshiba refers to its new product as an "electronic diary." By whatever name, we predict these devices will catch on.

Both offer specially designed readouts that can display not only numbers but the English alphabet. Sharp offers 37 memories to Toshiba's 30 wherein the user can store all sorts of information.

Enter your wife's birthday, for example, and on the appointed day your pocket companion will stridently "beep" to alert you and display the spouse-related reason on its liquid-crystal face.

The Toshiba can even link up to four alarms to one message. If you want it to say TAKE PILL four times in a day, then you can set it to sound off at each appropriate time.

Keep business appointments, romantic rendezvous and memo-pad messages, all in unfailing electronic

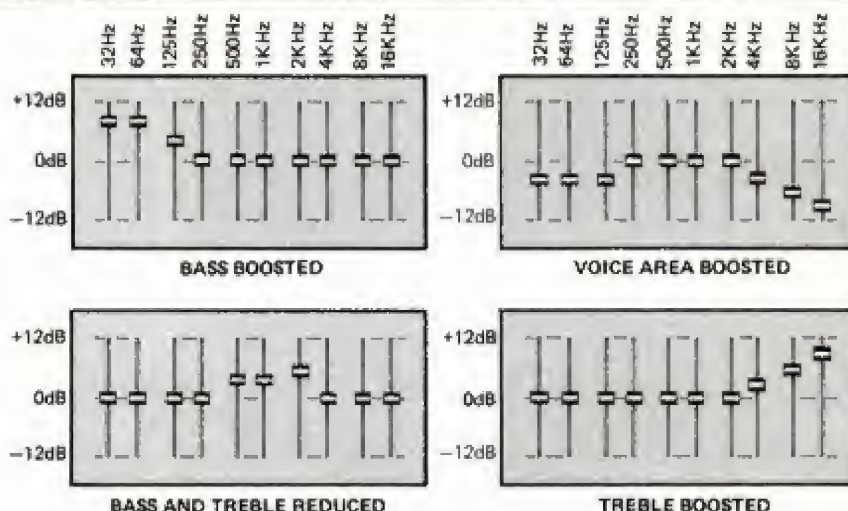


These electronic memo pads from Sharp (top) and Toshiba (right) store and recall any message or personal reminder.

memories. (Just don't forget to take the calculator with you each morning.)

Check out new checkmatters

Chafitz, in New York, recently unveiled a whole new line of chess computers to replace those we reported on in our May '79 issue (*PM Crowns the Computer Chess Champ*, page 118). Their flagship model, called an auto-response board, is truly an exciting innovation. Each square of the chessboard is equipped with an under-the-board sensor along with a



The great equalizer

Frequency equalizers, if properly used, can be a welcome addition to many a stereo-ophile's equipment shelf. Each control governs one range of frequency response (some offer dual controls, one for each

speaker, in every range). As we show above, you can re-arrange your music to suit yourself or your acoustical environment. But be warned. A great equalizer can't compensate for poor speakers or faulty amplifiers!

visible light. Move a piece, and the computer senses it and responds by illuminating a light on the square it wishes to move to. This eliminates keyboard entry. Unfortunately, the list price is a very steep \$875.

Chafitz has also developed a modular game system, which includes chess, backgammon and checkers, to retail at \$375. The latest in the "Boris" series of chess games is the Boris Diplomat, selling at \$119.

Do the new machines play better? Well, we hope to try out some of them, as well as those from other manufacturers such as Fidelity (Chess Challenger). In particular, Fidelity's new Chess Challenger 7, with hundreds of preprogrammed openings, looks very interesting.

Back to the shop blues

We receive a lot of unsolicited books for review—but we hardly ever read one so intently as we did Barry Deutsch's *How to Avoid TV Repair Rip-offs*. In the past I have had some horrendous experiences with TV repairs, but armed with this book, I think I could have avoided most of those problems.

Deutsch is a consumer lawyer who is the Director of Repair Services for New York City's Department of Consumer Affairs. He's heard it all when it comes to unscrupulous repair practices.

The book guides you through picking a repair shop, to understanding the contract, to knowing what to do if you're unhappy with the final re-

sults. While parts of the book's narrative may be a bit self-conscious, the information is indispensable.

The book is available by mail order for \$2.95 postpaid from Fight Back Publications, 2718 Ocean Ave., Brooklyn, N.Y. 11229. It includes a money-back satisfaction guarantee.

Room for one more?

Believe it or not, even outer space can be used up. Currently, communications satellites must be at least five degrees apart for good Earthside reception—and almost all available space directly above the Earth's equator has been taken!

General Telephone and Electronics (GTE) has announced a new type of antenna for Earth receiving stations. Called a "low sidelobe system," it can separate signals from more closely packed satellites. As more satellites are launched, such antennas will have to be developed even further. After all, you just can't stack satellites like so much cordwood.

PM



A man with dark hair, wearing an orange raincoat, is leaning over the side of a ship's deck. He is holding a thick rope with his right hand and has a lit cigarette in his mouth. The ship's structure, including a mast and rigging, is visible in the background. The sea is choppy with white foam from the ship's wake. The sky is a pale blue with some light clouds.

No compromise

Winston Lights didn't compromise

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

WIGHTS: 13 mg. "tar", 0.9 mg. nicotine; LIGHT 100's: 13 mg. "tar",
1.0 mg. nicotine av. per cigarette, FTC Report MAY '78.

on great taste to get low tar.
Why should I?

Winston Lights taste good
like a light cigarette should.





Velvet Smoothin'

Premium. Imported.



BLACK VELVET® BLENDED CANADIAN WHISKY, 80 PROOF. IMPORTED BY © 1980 HEUBLEIN, INC., HARTFORD, CT 06183.



NOTES FROM THE EDITOR

John A. Sittler

When you want a job done, ask a man who's already busy, goes the old saying. It worked for us when we wanted to have three new Volkswagen models tested (page 98). Gary Witzenburg, Detroit Auto Editor, did the driving for us during the same week that he competed in the International ADAC 24 Hours at Nürburgring, Germany, and then (while shaking off jet lag) roared around the Lime Rock, Conn., track at the annual Test Day sponsored by the International Motor Press Assn. The new Volkswagens were up in Vermont—another trip for Gary—where he gamely put them through their paces in snow.

It may seem like too much, but publication of Gary's newest book occurred while all the traveling and driving was going on. The book, *Mustang, The Complete History of America's Pioneer Ponycar*, comes from an author who has served as main propulsion assistant on Navy ships, flown Navy planes and served on the General Motors engineering staff (including a stint as car test engineer for the Corvette). As they say, ask a busy man...



Gary Witzenburg.



His new book.



Tom Sahagian pedaling—without wings.

Tom Sahagian admits, and he credits it with his ability to make an unusually long flight in the *Chrysalis*.

Tom later observed with some wonderment that when the 96-pound biplane was trucked to the flying site, the air in the truck weighed more than the airplane.

PM

Window replacement?

Introducing
exactly
what you
need in a
replacement
window



Andersen Windows

FREE

Don't replace your windows
until you've read this fact-filled
16-page brochure.
Find out the answers to
your most important window
replacement questions.

And learn how you can use
original quality Andersen®
Perma-Shield® windows instead
of special replacement windows.

Please send your free booklet, "Introducing
exactly what you need in a replacement window."
Mail to Andersen Corporation, Box 12,
Bayport, MN 55003

Name _____

Address _____

City _____

State _____

Zip _____

The beautiful way to save fuel®
Andersen® Windows



026-020

©1981 Andersen Corp. Bayport, MN 55003

IMPORTS & MOTORSPORTS

Fiat Panda



Perfect bumper car for Italian traffic, Panda's rubber protection wraps completely around lower body.

Like the giant panda with its asymmetrical eye patches, Fiat's new mini is one of the few cars produced with half a grille. Slots on the Panda are designed into the left side only. They're all that's needed to provide the engine with cooling air: a two-cylinder, 652-cc mill doesn't require a whole lot of airflow around it to keep its operating temperature optimum.

The new fwd Panda, now available in Europe, is the first of a new generation of economy cars that stretch a gallon further than ever, and squeeze every last cubic inch of interior space out of modest overall dimensions. We won't see the Panda here—certainly not while gasoline is still so reasonably priced, and nowhere near \$3 a gallon, as it is in Italy.

Volvo's GL concept

One of my pet peeves is how difficult—or downright impossible—it is to get luxurious, high-level appointments in a basic, standard-engine, economy sedan. All the plush options are offered in the high-powered, big-buck models only. This isn't the case, however, with Volvo's new-for-1980 GL model. It's four-cylinder under the hood, but elsewhere

it's got the standard equipment of the luxurious six-cylinder models: power windows, central locking, air, power steering and more. The strong, economical Four has more than enough power for all the gear. The sensible luxury car is here!

A Gemini for Citation?



Isuzu diesel could power future GM cars.

Isuzu Motors of Japan has just introduced that country's first small, diesel-powered passenger car. General Motors has been taking a keen interest in this powerplant. Since GM has a significant financial interest in the Japanese company, it's not

Volvo combined 240 and 260 series to produce thrifty, luxurious GL model.



at all farfetched to consider the possibility of diesel-powered LUVs and X-body cars (Citation, Phoenix, Skylark and Omega) in the near future. GM would surely have first dibs on exports of the 1.8-liter, compression-ignition Four. The engine features a 3.5-second start, even in subzero weather, with its QOS (Quick On System), and is claimed by the manufacturer to provide 60-mph-plus motoring. Stay tuned.

Mercedes for the museum



Mercedes-Benz GP racer is now on view.

As Speed Weeks at Daytona get ready to roll and the 1980 motorsports season gets under way, many fans are already making plans for their Indy pilgrimage. Just added to the Indianapolis Motor Speedway Museum is this W165 front-engine race car, built for the 1939 Grand Prix of Tripoli. Two machines were built and they finished one, two. They were never raced again due to a rules change after the race, so the car still sits on its original, specially developed Continental tires, only one race on the treads.

Good news department

The following items come from across the Atlantic and Pacific.

■ MGBs will continue to be available, production of the sports car having been extended to 1981 by BL Ltd.

■ Honda has just introduced an overdrive automatic transmission. For now, the "T-type" automatic is for home-market Preludes, but we're sure to see it here soon. **PM**



BY BILL HARTFORD



Introducing the first new truck of the 80's...

TOUGH NEW 1980 FORD

with the best gas mileage rating of any
American-built standard pickup:

Ford totally redesigned its pickups to help meet the fuel needs of the 80's: 19 MPG EPA estimate, 29 MPG highway estimate.* No other American-built standard pickup has ever achieved such a mileage rating. Plus Ford has the longest estimated range of any 1980 pickup.

Tough '80 Fords give you more payload capacity than last year's models with comparable GVWR's. An all-new cab. Exclusive Twin-I-Beam front suspension. Aerodynamic styling. And more.

See all the new 1980 pickups at your Ford Dealer. New 4x4's with Twin-Traction Beam Independent front suspension. Rugged new Six-Wheeler. Roomy new SuperCab.

BEST GAS MILEAGE RATING
of any American-built
standard pickup

19 EPA
EST.
MPG* **29** EST.
HWY.
MPG*

Standard 4.9L (300 CID) Six with
optional overdrive transmission.

LONGEST RANGE

722 **1,102**
EST. MILES HWY. MILES

Std. 72L (19-gal.) tank plus opt. 72L
(19-gal.) auxiliary tank (on LWB Style-
sides only). Total: 144L (38 gals.).



All-new cab interior. More leg
room than last year. New instrument
panel. New anti-theft features like
locking steering column, inside hood
release. New options include AM/FM
stereo with 8-track or cassette player,
underhood tool box.

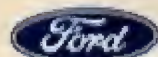
*EPA estimates. Compare these estimates with others. Your mileage and
range may differ depending on speed, distance and weather. Actual
highway mileage and range will probably be less than estimated.
California estimates lower. Diesels and car-trucks excluded.



**Ford pickups. America's best sellers
of the 70's.** (based on R. L. Polk & Co. registrations)

FORD

FORD DIVISION



**LOOKING FOR
THAT ONE BIG
OPPORTUNITY?**

**NTS
OFFERS YOU
FOUR.**



NTS/HEATH H-89 Microcomputer

Now, more than ever, it makes sense to build new skills and cash in on them. NTS gives you that opportunity—with solid training and exciting equipment to train on.

NTS's special Project Method of instruction helps you quickly acquire practical know-how in these exciting fields:

ELECTRONICS

We prepare you for the booming micro-processor field by having you work with your own micro-computer at home. You'll not only learn how to troubleshoot it, but how to program it to do what you want.



Or, work with your own digital color TV or 2-

meter FM transceiver in other courses.

Whichever of our 14 electronics programs you choose, count on working with the most exciting and innovative equipment offered by any home study school.

HOME APPLIANCES Excellent full or part time income possibilities. Course covers repair and servicing of washers, dryers, ranges and small appliances. You'll work with top testing gear.

ACT NOW TO DEVELOP YOUR POTENTIAL...WE GIVE YOU FOUR EXCITING WAYS TO DO IT, WITH EQUIPMENT AND TRAINING THAT MAKE HOME STUDY COME ALIVE!

AIR CONDITIONING/HEATING Prepare for one of the most essential industries in the world. Learn how to service commercial, industrial and residential heating and cooling equipment. We provide excellent specialized equipment while you learn.

AUTO MECHANICS Few technical fields can offer all the opportunities that the auto industry can. We offer "shop tested" instruction plus an impressive array of equipment, including a solid-state automotive oscilloscope. Learn engine diagnosis, motor overhaul and much more.



ACT NOW! SEND FOR OUR FREE COLOR CATALOG ON THE OPPORTUNITY OF YOUR CHOICE - TODAY!

NATIONAL TECHNICAL SCHOOLS

TECHNICAL-TRADE TRAINING SINCE 1905
Resident and Home-Study Schools
4000 South Figueroa St., Los Angeles, Calif. 90037

**NO OBLIGATION. NO SALESMAN WILL CALL.
APPROVED FOR VETERAN TRAINING.**

NATIONAL TECHNICAL SCHOOLS

Dept. 201-020

4000 South Figueroa Street, Los Angeles, CA 90037

Please send FREE color catalog

- ☐ MicroComputers/MicroProcessors
- ☐ Communications Electronics
- ☐ Digital Electronics
- ☐ Color TV Servicing

- ☐ Audio Electronics
- ☐ Auto Mechanics
- ☐ Air Conditioning
- ☐ Home Appliances

Name _____ Age _____

Address _____

Apt. _____ City _____

State _____ Zip _____

☐ Check if interested in G.I. information.

☐ Check if interested ONLY in classroom training in Los Angeles.

Dual CS521

Realistic
Lab 500Realistic
Lab 55Eumig
MetropolitanPioneer
PL-630Realistic
Lab 49

Dual 819

Pioneer
RT-707

What to look for in new direct-drive audio gear

The secrets of direct-drive turntables and cassette decks are simple to unravel. Understanding them can help you to choose your next turntable or deck.

by Art Zuckerman

Something wonderful has been happening to turntables. They have been shedding most of their audio problems. Speed irregularities are being banished and so is the low, rumbling noise that's known,

appropriately enough, as rumble.

Audio engineers have been chipping away at these problems for many years. But now they have achieved new standards of excellence with a superior drive system. It is called direct drive, and in a relatively short time it has become dominant at the top end of most

turntable product lines. It has even made incursions into the medium- to lower-price ranges—and into cassette and open-reel decks.

Direct drive is just what its name suggests—a motor that operates at precisely the selected playing speed and drives the turntable directly. Conventional phonograph motors have always operated at speeds enormously higher than that of turntable rotation—1800 rpm versus 33½ rpm. At this great speed, a

(Please turn to page 22)

Friendly Comparison

Can JS&A offer a better telephone answering unit than the first one we introduced? Here's the story of American competition at its finest.



We've seen them all. Every telephone answering unit has its advantages and disadvantages.

So when JS&A selected our first telephone answering unit three years ago and called it the best remote system available, it soon became one of the most popular units on the market. Since 1976, JS&A has sold thousands of them.

SERIOUS COMPETITION

But that was three years ago. It finally took an enterprising company called Olympia to develop and introduce what we would call the first serious competition to our first telephone answerer.

So JS&A had a dilemma. Here we were, with an excellent relationship with a major supplier, and yet our reputation demands that we offer our customers only the most advanced products. Do we continue to carry both units, or do we break off relations completely and introduce a competitive model? To make the decision more difficult, you first have to understand the new technology in the Olympia unit.

A FAIR COMPARISON

The Olympia Master Telephone Recorder is a microprocessor-based system with a few features that make it a more advanced unit than the industry leader.

But to provide a fair comparison, there are a few disadvantages with the Olympia. The Olympia does not have a call counter that tells you at a glance how many calls you've received. And its outgoing announcement is not recorded as fast as with our first unit. But there are so many other features and advanced technology that the Olympia deserves your consideration.

ERASE OR SAVE

Most remote units and the Olympia have remote pagers. When you want to retrieve your messages, simply hold the pager up to the telephone, press a button, and the telephone answering unit rewinds to the start of your first message and plays them back.

That's great. But there was a disadvantage to the others. After you listened to your messages, you could not rewind. If you wanted to rewind to the beginning of the tape, you had to call your unit a second time. That's only a slight problem if you're calling locally from a phone booth, but very costly when you're calling long distance. And if you don't call back right away and rewind, you have another problem. Later, you'll have to listen to all those messages you previously heard because the unit doesn't know where the old messages stop and the new ones start.

The new Olympia Master Recorder has solved that problem. You have a choice. You can either hang up after you've heard your

messages or you can rewind them to the beginning while you're on the phone.

NO MESSAGE/LAST MESSAGE

Let's say you call in and there are no messages for you. The Olympia has a special beep tone that tells you the moment you call in that there is no message. Or let's say there are three messages waiting for you. After the three messages are played back, another beep tone signals you that you've finished your last message. There is no provision like this on any of the popularly priced units.

YOUR OWN TAPE

The Olympia uses one commercially available cassette tape that will last a few years with normal use. Today's most popular unit uses a built-in tape that will last five years, and costs \$17 to replace. With the Olympia unit, you remove the old cassette and pop in the new one which shouldn't cost more than \$2.

TAPE SPEED

It costs time and money to listen to your old messages and to rewind. So the Olympia not only improved the concept by giving you a choice, they also improved the tape rewind speed. Now, when you retrieve your calls, your rewind time is faster than many other systems and as fast as the system we formerly sold.

Not only is the Olympia faster, but it measures only 2 1/4" x 6" x 10" and weighs only 36 ounces. You can place your phone on top of the unit or next to it without cluttering your desk.

We could probably present reasons why the Olympia Master Recorder will pay for itself with just the time you save retrieving messages—but there's more.

SINGLE SYSTEM

You record your outgoing announcement on one track of the cassette tape and you receive your incoming messages on the other side. This single cassette approach reduced the costs of the Olympia below those of the conventional recorders that required two separate record and playback systems. And like other units, when you play back your tape, you hear only your incoming messages—never the outgoing announcement.

To record an outgoing announcement, you simply press the record button and talk into a microphone supplied with the unit. The unit will record a 17 second outgoing announcement and a 30 second incoming message. Our previous unit records a 20 second outgoing announcement and a 30 second incoming message.

AND THEN THERE'S VALUE

Our previous unit sold for \$269.95. The Olympia sells for only \$169.95—a \$100 savings before you even start to use the system.

But don't take our word for it. Order an Olympia from us on our 30-day telephone answering test. Personally see how quickly you can retrieve or rewind your messages without having to call in twice. See how this compact unit fits on your desk. And above all, note the quality and workmanship of this fine piece of equipment.

Then after 30 days of messages, decide if you want to keep your unit. If not, no problem. Just return your unit for a prompt and courteous refund including your \$3.50 postage and handling.

If you decide to keep it, great. You'll own the most advanced unit of its kind. The Olympia Master Recorder is sold exclusively by JS&A. We're America's largest single source of space-age products, and we have sold more telephone answering units than many of our competitors combined. We know the market.

MULTI-NATIONAL CORPORATION

Olympia is a multi-national corporation with eight national factory service and service-by-mail facilities—further assurance that your modest investment is well protected.

To order your Olympia, send a check for **\$169.95** plus \$3.50 postage and handling made payable to JS&A Group, Inc. (Illinois residents add 5% sales tax.) Credit card buyers may call our toll-free number below. We'll send your unit complete with recording microphone, one cassette tape, remote pager, AC adapter, instructions, and a 90-day limited warranty—everything you'll need for your 30-day test.

When we realized that the Olympia was the unit we should market, we called our previous supplier and told them of our decision.

In today's changing times, technology does not stand still. Despite our excellent relationship with our previous supplier, we felt it our obligation to introduce today's most advanced products—even at the risk of losing a valuable supplier.

If you're considering a new telephone answering unit, we can't recommend a better system than the Olympia Master Recorder. Why not order one at no obligation today?

JS&A PRODUCTS
THAT THINK

Dept. PM One JS&A Plaza
Northbrook, Ill. 60062 (312) 564-7000
Call TOLL-FREE 800 323-6400
In Illinois Call (312) 564-7000
©JS&A Group, Inc. 1979

NEW DIRECT-DRIVE AUDIO GEAR

(Continued from page 20)

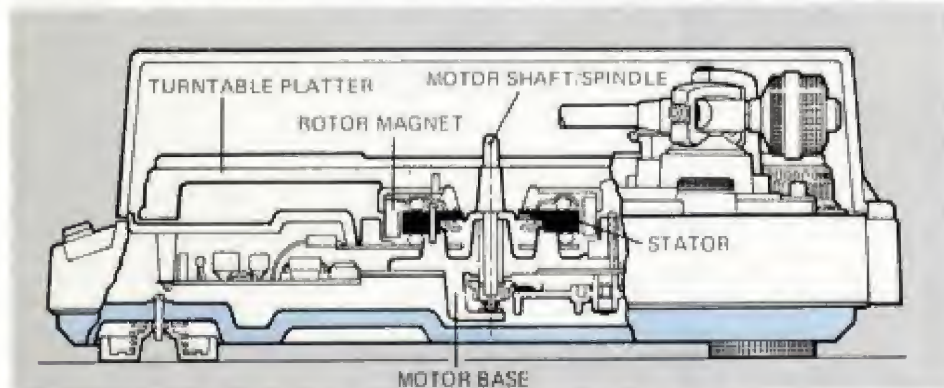
motor generates vibrations of 30 hertz (Hz) and its multiples or harmonics. Power from the motor is transmitted to the turntable by a mechanical linkage, which may also transmit some of the 30 Hz/harmonic vibration to the pickup to create audible rumble.

Because direct-drive motors oper-

pulley diameter to rim diameter.

The belt acts like a filter, absorbing most of the low-frequency motor vibrations instead of transmitting them. As long as proper tension is maintained, a good belt won't create speed irregularities until it finally wears out.

Until just a few years ago, belt drives were employed in all higher-quality turntables. The introduction of good servomotors with effective



Technics makes its turntables so that the direct-drive motor is a part of the platter.

ate at speeds of no more than 45 rpm or, at most, 78 rpm, the vibrations they generate are at such low frequency that they fall well into the inaudible, subsonic range. In effect, such motors generate no rumble whatsoever.

On the other hand, rumble is a particularly severe problem in lower-priced changers, where the transmission device is a puck-like rubber wheel called an idler pulley. In operation, it presses against both the motor pulley and the inner rim of the turntable.

The motor pulley is mounted on the motor shaft, and along its length it has two or three different diameters, depending on number of speeds at which the changer is designed to operate. Positioning the idler wheel against one of these diameters establishes operating speed.

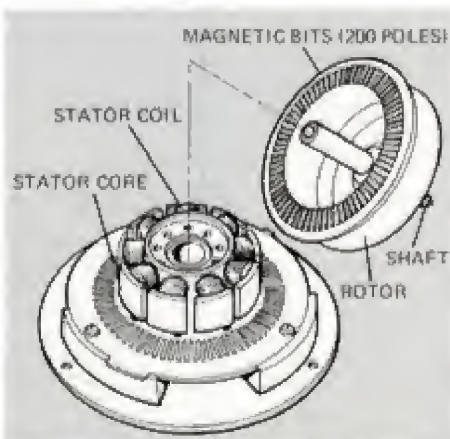
Because the idler wheel is a solid piece of material, it tends to transmit rumble-causing vibrations. If it is the least bit out of round, it will also create flutter-like speed variations. Leaving the idler wheel engaged when the power is off leads to this condition by creating flat spots on the idler at the points of stationary contact.

From belts to direct drive

A far superior linkage is the belt drive, in which a precision-ground belt goes around either the rim or a special flange on the bottom of the turntable and also around the motor pulley. In this system, too, speed is usually changed by moving the belt from one diameter on the motor pulley to another, changing the ratio of

feedback-control systems began to change all that. The speed of such motors is controlled directly by electrical signals. Some form of reference signal for the chosen playing speed is provided, and the actual speed of the motor or platter is sensed in some way. The sensing circuit also generates a signal that varies indirect proportion to speed changes. This signal is compared with the reference. Any deviation between the two creates a difference signal, which is fed back to the motor to alter its speed.

A direct-drive turntable is not necessarily free of problems. Much depends on how it is engineered. If a speed variation is allowed to become too great before the system responds, the corrective action can lag far enough behind the problem to make it audible. Another problem is cogging, caused when the poles of the motor are spaced so far apart



Magnetic bits on rotor are sensed to detect the speed of Pioneer table.



In the belt-drive turntables, moving the belt from one diameter of the pulley to another changes its speed.



Denon's direct-drive turntables use a recording-style head to sense the speed of the platter.

that they impart a pulsing action, or flutter, to the turntable.

Almost universally, a heavy turntable is still a major defense against minor speed variations because its inertia tends to smooth out such variations. Better turntables also usually have high-torque motors that are more responsive to correction signals.

Ideas in the field

There are a variety of approaches to speed-sensing systems. JVC offers what it calls a super servo frequency generator, an integral part of the servomotor assembly. It consists of a magnetic disc with either 90 or 180 slits around its periphery. The disc faces a round circuit board with an equal number of printed coil elements. As the disc rotates with the motor shaft, pulses are generated in the coils. According to JVC, the output of all the coils are integrated and averaged to create a wave form with constant pitch.

Many of Pioneer's direct-drive turntable motors have a rotor faced with 200 magnetic bits. A facing plate around the stator core of the motor has a matching array of 200 elements that detect magnetic fields and react to them by pulsing. As it rotates, the elements pulse a signal proportional to motor speed.

Magnetic detection is also employed in Denon turntables, but in this case the magnetic patterns are recorded on the inner rim of the

(Please turn to page 24)



Bone FoneTM

*A new concept in sound technology
may revolutionize the way we
listen to stereo music.*

*The Bone Fone surrounds your entire body
with a sound almost impossible to imagine.*

You're standing in an open field. Suddenly there's music from all directions. Your bones resonate as if you're listening to beautiful stereo music in front of a powerful home stereo system.

But there's no radio in sight and nobody else hears what you do. It's an unbelievable experience that will send chills through your body when you first hear it.

AROUND YOU

And nobody will know you're listening to a stereo. The entire sound system is actually draped around you like a scarf and can be hidden under a jacket or worn over clothes.

The Bone Fone is actually an AM/FM stereo multiplex radio with its speakers located near your ears. When you tune in a stereo station, you get the same stereo separation you'd expect from earphones but without the bulk and inconvenience. And you also get something you won't expect.

INNER EAR BONES

The sound will also resonate through your bones—all the way to the sensitive bones of your inner ear. It's like feeling the vibrations of a powerful stereo system or sitting in the first row listening to a symphony orchestra—it's breathtaking.

Now you can listen to beautiful stereo music everywhere—not just in your living room. Imagine walking your dog to beautiful stereo music or roller skating to a strong disco beat.

You can ride a bicycle or motorcycle, jog and even do headstands—the Bone Fone stays on no matter what the activity. The Bone Fone stereo brings beautiful music and convenience to every indoor and outdoor activity without disturbing those around you and without anything covering your ear.

SKI INVENTION

The Bone Fone was invented by an engineer who liked to ski. Every time he took a long lift ride, he noticed other skiers carrying transistor radios and cassette players and wondered if there was a better way to keep your hands free and listen to stereo music.

So he invented the Bone Fone stereo. When he put it around his neck, he couldn't believe his ears. He was not only hearing the music

and stereo separation, but the sound was resonating through his bones giving him the sensation of standing in front of a powerful stereo system.

AWARDED PATENT

The inventor took his invention to a friend who also tried it on. His friend couldn't believe what he heard and at first thought someone was playing a trick on him.

The inventor was awarded a patent for his idea and brought it to JS&A. We took the idea and our engineers produced a very sensitive yet powerful AM/FM multiplex radio called the Bone Fone.

The entire battery-powered system is self-contained and uses four integrated circuits and two ceramic filters for high station selectivity. The Bone Fone weighs only 15 ounces, so when worn over your shoulders, the weight is not even a factor.

BUILT TO TAKE IT

The Bone Fone was built to take abuse. The large 70 millimeter speakers are protected in flexible water and crush resistant cases. The case that houses the radio itself is made of rugged ABS plastic with a special reinforcement system. We knew that the Bone Fone stereo may take a great deal of abuse so we designed it with the quality needed to withstand the worst treatment.

The Bone Fone stereo is covered with a sleeve made of Lycra Spandex—the same material used to make expensive swim suits, so it's easily washable. You simply remove the sleeve, dip it in soapy water, rinse and let the sleeve dry. It's just that easy. The entire system is also protected against damage from moisture and sweat making it ideal for jogging or bicycling.

The sleeve comes in brilliant Bone Fone blue—a color designed especially for the system. An optional set of four sleeves in orange, red, green and black is also available for \$10. You can design your own sleeve using the pattern supplied free with the optional kit.

YOUR OWN SPACE

Several people could be in a car, each tuned to his own program or bring the Bone Fone to a ball game for the play by play. Cyclists,

joggers, roller skaters, sports fans, golfers, housewives, executives—everybody can find a use for the Bone Fone. It's the perfect gift.

Why not order one on our free trial program and let your entire family try it out? Use it outdoors, while you drive, at ball games or while you golf, jog or walk the dog. But most important—compare the Bone Fone with your expensive home stereo system. Only then will you fully appreciate the major breakthrough this product represents.

GET ONE SOON

To order your Bone Fone, simply send your check or money order for **\$69.95** plus \$2.50 postage and handling to the address shown below. (Illinois residents add 5% sales tax.) Credit card buyers may call our toll-free number below. Add \$10 if you wish to also receive the accessory pack of four additional sleeves.

We'll send you the entire Bone Fone stereo complete with four AA cell batteries, instructions, and 90-day limited warranty including our prompt service-by-mail address.

When you receive your unit, use it for two weeks. Take it with you to work, or wear it in your car. Take walks with it, ride your bicycle or roller skate with it. Let your friends try it out. If after our two-week free trial, you do not feel that the Bone Fone is the incredible stereo experience we've described, return it for a prompt and courteous refund, including your \$2.50 postage and handling. You can't lose and you'll be the first to discover the greatest new space-age audio product of the year.

Discover the freedom, enjoyment, and quality of the first major breakthrough in portable entertainment since the transistor radio. Order a Bone Fone stereo at no obligation, today.

*Pending FCC approval.

JS&A PRODUCTS
THAT
THINK[®]

Dept. PM One JS&A Plaza
Northbrook, Ill. 60062 (312) 564-7000
Call TOLL-FREE 800 323-6400
In Illinois Call (312) 564-7000

©JS&A Group, Inc., 1979

TO COMPLETE
YOUR WORKSHOP
**ATLAS
BANDSAW**
IT'S CONVERTIBLE



NOW
ONLY
\$23500

plus \$30 handling and shipping

The Atlas Band Saw • Handles cut-off operations in a wide range of metals — from steel and iron, to aluminum, brass and copper • Comes complete with 1/2 hp, 1725 rpm motor • Takes any shape stock — bar, flat, square, hex, tubing structural shapes, and cuts it at any angle from 90° to 45° Max. capacity is 4"x6" • 3-speed V-belt and worm gear drive offers speeds of 90, 155, 250 rpm • Swiveling rapid approach/release type vise allows fast set ups. Set desired cut, and spring control feeds blade at proper speed for smooth, fast cuts • Has stock stop for repeat cutting • *Converts to vertical position* for contouring, notching, slitting, and other operations in metal or wood. Length 41", height 37", width 16 1/2". Extends to 43" length, 47 1/2" height in vertical position.

ATLAS BANDSAW

Mail To: ATLAS PRESS COMPANY, Dept. 145
2019 N. Pitcher, Kalamazoo, MI 49007

Please send me the Atlas Band Saw (Model 4359).
Enclosed is my check or money order for \$265.00.
(Includes shipping and handling) or charge my order to:

☐ VISA ☐ Master Charge

Acct. # _____ Exp. Date _____

Name _____

Address _____

City/State/Zip _____

☐ Send FREE Atlas Power and Hand Tool Catalog.

Michigan residents add 4% sales tax

Available continental U.S.A. only

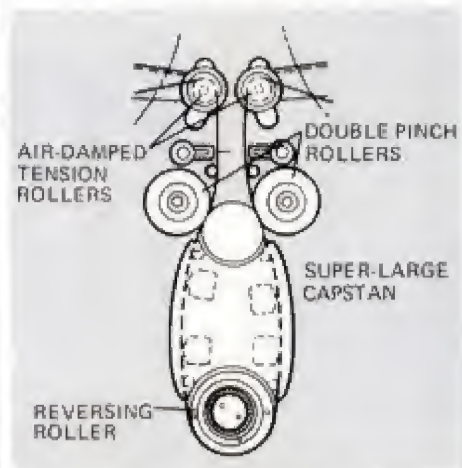
Price subject to change without notice.

WHAT TO LOOK FOR IN NEW DIRECT-DRIVE AUDIO GEAR

(Continued from page 22)

turntable platter. There are 1000 such recorded pulses, and they are read by a magnetic head identical to those in tape recorders.

A totally different approach to a control-frequency generator is taken in Sansui's SR 929 turntable.



Technics' isolated-loop system uses single capstan to drive tape at two points.

Here, infrared light-emitting diodes (LEDs) cause a photo transistor to pulse as the drive motor turns.

Fisher's direct-drive turntables use the more customary magnetic-detection approach, but in a very unorthodox linear motor. The turntable platter is part of the motor. Attached to the platter's inner flange is a continuous band of ferrite material oriented into 120 magnetic poles.

Mounted atop the turntable base is a ring of matching electromagnetic drivers that alternately attract and repel the poles, causing rotation. Sensing coils arranged in a ring concentric with the drivers detect the revolving magnetic patterns as the flange goes by and generate a signal.

Although more conventional in their motor design, Technics direct-drive turntables are constructed so that the rotor element is an integral part of the turntable platter. As in the Fisher design, there is only one moving part in the entire motor assembly.

Dual's direct-drive model GS 721 has a motor with two overlapping layers of eight coils each. This eliminates even the briefest pause between magnetic pulses.

At the top of virtually every line of direct-drive turntables today are quartz-controlled models. These use a quartz crystal precisely the way quartz watches do, to provide an almost absolute time reference.

Most direct-drive turntables have

speed-adjustment controls so that you can tune pitch to a play-along instrument or hand-tweak the speed. Conventional turntables have a separate strobe pattern for checking each speed. More sophisticated models have only one pattern because the strobe lamp itself adjusts its pulse to the reference frequency for the playing speed that is in use. Pioneer's PL-630 does away with the strobe altogether but substitutes a pitch meter. Several JVC models even have digital speed read-outs.

Servomotors are also coming into increasing use in tape decks to drive their capstans, either via belt or direct drive. Several of the better open-reel machines, such as Pioneer's low-profile RT-700 series, which can be rack-mounted, have direct-drive capstans. The innovative "isolated-loop" series of Technics open-reel machines not only have direct drive but also quartz-locked feedback control.



State-of-the-art direct-drive is used in this Fisher Model MT6225 turntable using linear direct-drive.

But relatively few cassette decks have gone the direct-drive route yet. One that has is particularly unusual, the Eumig CCD, top-loading deck. It senses the speed of the capstan, which is an extension of the motor shaft, optically via a lightweight disc that is photo-etched with 2500 radii.

Technics, taking a more customary approach, has already marketed direct-drive, front-loading cassette decks with a quartz-locked control system. The company says that, until recently, motors that were sufficiently compact for use in a front-loading, direct-drive system simply weren't available.

It is probably safe to say, judging from trends in turntable design, that as more manufacturers learn to make such compact motors, direct drive will also become the standard in cassette-deck, top-of-the-line offerings.

FM

U.S. Government Report:



Box or menthol:

Ten packs of Carlton have less tar than one pack of...

	Tar mg./cig.	Nicotine mg./cig.
Kent	12	0.9
Kool Milds	14	0.9
Marlboro Lights	12	0.8
Merit	8	0.6
Merit Menthol	8	0.6

	Tar mg./cig.	Nicotine mg./cig.
Parliament Lights	9	0.6
Salem Lights	10	0.8
Vantage	11	0.8
Vantage Menthol	11	0.8
Winston Lights	13	0.9

Carlton is lowest.

Less than 1 mg. tar,
0.1 mg. nic.

Of all brands, lowest... Carlton Box: less than 0.5 mg. tar
and 0.05 mg. nicotine av. per cigarette, FTC Report May '78.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

Box: Less than 0.5 mg. "tar", 0.05 mg. nicotine;
Soft Pack and Menthol: 1 mg. "tar", 0.1 mg.
nicotine av. per cigarette, FTC Report May '78.

NEW NOW for home and shop



A



B

A This $\frac{3}{8}$ -in. variable-speed drill-screwdriver from Skil has a 0 to 250 rpm range for tough drilling and screw-driving, and a 0 to 750 rpm range for faster work. The tool shifts gears to deliver full power at either range, according to Skil. It also has a reversing switch and double-reduction gearing for added torque. The cordless drill runs on a rechargeable power pack. Model 2016 is \$100, including power pack and recharge unit. The manufacturer is Skil Corp., 4801 Peterson Ave., Chicago, Ill. 60646.

B Super 440 structural building board offers advantages as sheathing material. It eliminates the need for corner bracing or plywood at corners and provides twice the R-value insulation of wood, according to Homasote, its maker. Super 440 can also be used for carpet padding, porch ceilings, partitions and in other areas. It comes in $\frac{1}{2}$ - and $\frac{3}{4}$ -in. thicknesses, in 4-ft. widths and 8-, 9-, 10- and 12-ft. lengths. It's sold in lumberyards for 26 to 28 cents per sq. ft.; maker is Homasote Co., Box 7240, West Trenton, N.J. 08628.

C Kitchen range hoods custom-built of wood to match all styles of Quaker Maid kitchen cabinets are now available. The hoods feature a metal-lined interior with factory-equipped ventilating system and lights. The ventilator clears 300 cu. ft. of air per minute, according to the maker. A snap-out panel provides easy access for wiring and duct work on the installation. Hoods priced from \$780 will fit range areas from 30 to 60 in. wide in wall-mounted or island models. Quaker Maid, Rt. 61, Leesport, Pa. 19533.

D This full-size, playable harpsichord comes in a kit of precut wooden parts. It is a replica of a 1765 Baker Harris instrument. The harpsichord has five full octaves, measures $2\frac{1}{2}$ x 6 ft. and weighs 100 lbs. The kit's preshaped parts are patterned after the parts on the original. Details of construction and decoration also closely follow those of the original. Harpsichord is priced from \$1200 for the basic precut kit to \$4200 for the built-up instrument. Frank Hubbard Inc., 185A Lyman St., Waltham, Mass. 02154.



C



D

Portable refrigeration price breakthrough! Last chance: \$134*

Solid State Refrigeration makes portable coolers as obsolete as grandma's kitchen ice box.

The kindest thing you can say about ice boxes is they're better than nothing.

They fall down on the job in hot weather. They look more like swimming pools than refrigerators when the ice melts. And, every other day, you have to dig into your pocket to buy more ice. (If you can find it).

Koolatron's 12 volt portable refrigerators work on thermoelectrics, not ice. And maintain normal refrigeration temperatures.

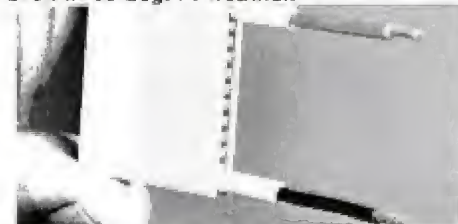
So taking the Koolatron on your trip is like taking a small version of your home refrigerator. Everything — and everybody — stays cool.

USES AEROSPACE REFRIGERATION MODULES

The Koolatron portable cools your food electronically with solid state thermoelectric refrigeration modules. These same powerful modules are used by military and aerospace scientists to cool critical components in rockets and satellites. They use thermoelectric cooling because of its absolute reliability, insensitivity to motion or level, small size & weight and minimal battery drain.

WHY IS THE KOOLATRON PORTABLE SO MUCH BETTER THAN AN ICE CHEST?

An ice chest maintains an air temperature of 50-60 deg. F. Meat and milk spoil rapidly at temperatures above 50 deg. F. which is why the top of your meat will go bad even when it is sitting on ice. Koolatron portables maintain normal home refrigeration temperatures of 40-45 deg. F. even in 95 deg. F. weather.



Two of these miniaturized thermoelectric modules replace all the bulky complex piping coils, compressors and motors in conventional portable refrigerators. The modules pump heat from your food into efficient heat sinks where it is dissipated by a quiet fan. They operate on a principle called the "Peltier Effect" — passing electricity through the junction of dissimilar metals causes heat to flow away from the junction.

BOATING, FISHING, CAMPING, HUNTING

Fits into virtually any boat, van or camper. Carry it on the back seat during car trips. Ideal for fishing and hunting — bring your catch back home fresh (a few loads of fish fillets could pay for your portable). Use it for grocery shopping, medicines, carrying film, salesmen's samples. Take it to the drive-in movies, auto races and other sporting events. With an inexpensive battery charger you can use your

Koolatron as a bar fridge all winter and a patio fridge in the summer. Run it in your motel room at night and enjoy a midnight snack whenever you feel like it. We have customers using our portables on construction sites, in workboats, laboratories and even in locker rooms for a "cold one" after the game.

THE ULTIMATE PORTABLE REFRIGERATOR

It weighs less than most coolers with a block of ice but holds over 40 lbs. of food or 48 pop cans in its large 36 qt. capacity. Plug it in a lighter socket in your car, boat or van or operate it from a 12 volt battery charger plugged into 110 volts. Cold contents will stay cold overnight with unit off. Draws a maximum of 4 amps., averages about 2 amps. at 70 deg. F. with the thermostat on. Keeps your food cold and dry. Exterior dimensions are 21"L x 16"W x 16"H. Interior dimensions are 16"L x 11-1/2"W x 12"H.

BUILT-IN QUALITY AND DURABILITY

The rugged "ABS" case is filled with the best insulation available — rigid urethane foam. It has a "150 lb. test" handle and non-rusting polypropylene hinge and latches, with stainless steel fasteners. Your portable comes with a 9 ft. detachable cord which plugs into your cigarette lighter. It also has terminals for attaching wires directly from a battery or fuse panel. The same terminals are used for your battery charger clips when operating from a charger. A reverse polarity warning light & buzzer are included. Because of Koolatron's solid state construction your unit should never require any servicing unless physically damaged. If service is ever required, it is available through our service depots in Batavia, NY, or Barrie, Ont., Canada.

GUARANTEE, 21-DAY MONEY-BACK TRIAL PERIOD

Your Koolatron comes with a written 1 year guarantee plus complete instructions and helpful information about batteries and chargers. If for any reason you are not totally satisfied, return it for a prompt refund in full.



PAYS FOR ITSELF

If you are regularly using ice, your Koolatron portable will pay for itself with the money you save on ice, spoiled food,



*\$25 off-season saving ends with this ad.

The Koolatron portable keeps over 40 lbs. of food at household refrigeration temperature but weighs only 15 lbs. Only 21" x 16" x 16" ext. Model F1A shown.

restaurant bills and the gasoline used looking for ice.

SPECIAL OFF-SEASON DISCOUNT!

The Koolatron F1 has regularly been selling at \$159. (\$179 in Canada.) By ordering off-season you can save a full \$25 off these prices. You save! We keep our plant at an efficient operating level off-season! But you must order now.

ADJUSTABLE THERMOSTAT OPTION

For an additional \$10.00 you can order the Koolatron portable with an adjustable thermostat in place of the standard fixed temperature thermostat — order Model F1A.

OPTIONAL 110 VOLT ADAPTOR

This custom-made adaptor allows you to operate anywhere on 110 volt power... home, cottage, hotel, patio, pool, ... \$29.95 (\$34.95 in Canada) plus \$3 shipping. Special price if ordered with main unit only \$25.00 (\$30.00 in Canada). No shipping charges — save \$7.95.

Koolatron Industries Limited,
56 Harvester Ave., Batavia, New York 14020

Phone your order in collect to

705-737-0842

Or use this handy order coupon.

Koolatron INDUSTRIES LIMITED

56 Harvester Ave., Batavia, New York 14020

Canada: 230 Bayview Drive, Barrie,

Ontario L4N 4Y8

Dept. 1048

Send me... Koolatron F1 @ \$134.00

(\$154.00 in Canada) + \$7.00 each for handling and delivery in USA or Canada (N.Y., Ont. and Que. residents add sales tax.)

___ I want model F1A and have added \$10.00.

___ I also want the power adaptor and have added \$25.00 (\$30.00 in Canada) shipping included. If I order separately it will be \$29.95 (\$34.95 in Canada) plus \$3 for shipping.

I understand that I may return either item undamaged within 21 days and get a full refund if I am not satisfied. I enclose my ☐ cheque

☐ money order for \$___ or, please charge my ☐ Visa ☐ Mastercharge ☐ American Express.

Acct. No. _____

Expiry Date _____ ☐ Send brochure only

Signature _____
(necessary to ship merchandise)

Name _____

Address _____

City _____

State _____ Zip _____

P634

FEBRUARY 1980

27

DANDY DRAWERS

BUILD YOUR OWN STORAGE AND SAVE!!

\$12.00

**SPECIAL
OFFER**



MOLDED SLOTS
FOR PARTITIONS

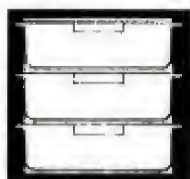


BUILT IN EASY
SLIDER LIPS

ONE PIECE,
INJECTION MOLDED,
HIGH IMPACT, PLASTIC

MOLDED
HANDLE

STACK



UNDER BENCH



Design and build your own custom storage with the easy sliding DANDY DRAWERS. Just cut slots (kerfs) in your standard 6", 8", 10" or 12" boards for the two drawer lips. Simple and fast.

Thousands in use in the kitchen, garage, camper, kid's room, industry, etc.

Dealer inquiries invited

BAUMBACH
Engineering Co.
640 National St.
Mt. View, CA 94043

Please send (check one or more), @ \$12.00 each. Selection:

- ☐ 4 Large DANDY DRAWERS (11" x 7-3/4" x 2-7/8")
- ☐ 6 Regular DANDY DRAWERS (9" x 5-3/4" x 2")
- ☐ 10 Small DANDY DRAWERS (7-3/16" x 4-7/16" x 1-1/2")
- ☐ 12 Dinky DANDY DRAWERS (5-3/16" x 3-3/16" x 1-1/8")

Color: ☐ Red ☐ Blue ☐ Green ☐ Yellow ☐ Mixed

Enclosed is \$_____ for _____ selections.

☐ Cash ☐ Check ☐ Money Order. NO C.O.D.'s PLEASE.

Name _____

Address _____

City _____

State _____

Zip _____

All drawers shipped prepaid in continental USA. California residents add 6% sales tax.

New storm door lets your front door show

No longer do you have to hide your expensive, carefully chosen front door behind a storm door. The version shown (bottom photo) allows a picture-window view of your entry. It's available with a white, bronze, brown or black aluminum frame and clear, tempered safety glass. In standard front-door size—36x84 in.—it's priced at \$110.

For \$30 more, door also has PPG's Solargray tinted, tempered safety glass, shown, which cuts heat gain and brightness. Feather-Lite Manufacturing Co., 1210 East Maple St., Troy, Mich. 48069, makes it. **PM**



A handsome front door like this one is often hidden by a conventional storm door.



This storm door allows full view of expensive front door. Aluminum frame holds 30 x 70-in. panel of Solargray tinted glass.

ARROW

presents

**America's most USEFUL gift
for the Do-it-Yourselfer!**



No. T-50MP
8-PIECE
Multi-Purpose
STAPLE GUN KIT

SHOOT A STAPLE WHEREVER YOU'D DRIVE A NAIL!

You'll handle all of the 1,001 home fix-up fastening jobs faster, cheaper, better! It's a breeze: one squeeze and you've nailed it with Arrow's powerful T-50 Staple Gun! All steel construction, jam proof, lasting chrome finish. Uses six staple sizes.

No. T-50MP 8-PIECE MULTI-PURPOSE STAPLE GUN KIT includes Arrow's All-Purpose T-50 Heavy Duty Staple Gun plus all these extra accessories: slip-on Wiring Attachment; slip-on Screen Attachment; slip-on Shade Attachment; staple lifter; 1250 T-50 1/4" staples; 1250 T-50 1/2" staples; 1250 Ceatite staples. Complete with heavy duty molded storage case.

Sold at all leading Hardware, Home Center and Discount Department Stores everywhere

ARROW FASTENER COMPANY, INC.
271 Mayhill Street, Saddle Brook, N.J. 07662

AND PERFORM.

This is a highly engineered chain saw for those people who are serious about woodcutting. The Stihl 028WB. A high performance, mid-size saw with all the design integrity of the big professional Stihl saws—which are the best-selling saws in the world! Like the pro saws, the 028WB is a saw you can count on to start right up, winter or summer, to run smoothly and handle easily. And to do the job you give it to do.



"With 15" bar and chain.

AND PERFORM.

A combination of light weight, high-engine output and Anti-Vibration makes it one of the most versatile chain saws made. As well as one of the most advanced saws of its type, with features the competition can't touch. The 028WB is sure to turn in a first-class performance. Every time you use it. And at a manufacturer's suggested retail price of just **\$279.95***. Get all the details on this great performer at your local Stihl dealer.

THE 028 WB FROM STIHL. WATCH IT PERFORM.



STIHL®

The World's Largest Selling Chain Saw.

* Registered Trademark (pronounced "Steel") © Copyright 1979 Stihl Incorporated, Department 1076, 536 Viking Drive, Virginia Beach, Virginia 23462. For sales and service see the Yellow Pages under "saws."



Irwin makes your 'Popular Mechanics' projects easier!

From furniture to a new family room, Irwin quality products can help!



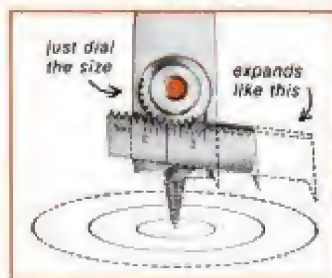
You can easily bore holes up to 1 1/2" with the Irwin Speedbor® "88". This is the wood bit that cuts clean, fast, accurately. Puts more boring power at the working end of your 1/4" electric drill.

Irwin's exclusive hollow ground point has the power to start holes fast. Sharp spade-type cutters power through any kind of wood (fast). 1/4" shank chucks perfectly.

Every Irwin Speedbor "88" forged from solid bar of finest tool steel. Machine-sharpened. Heat tempered full length to last. 17 individual sizes, 1/4" to 1 1/2". Also sets of 4, 6 & 13 bits. Buy wherever fine hand tools are sold.



Irwin workshop special
All metal rack & 8 bits, sizes 1/4" to 1".



Irwin Micro-Dial® bores 35 hole sizes

Just dial the size hole you want, up to 3 full inches. Taper square shank fits all hand braces. Machine-sharpened spur and cutters deliver clean, accurate boring action. No. 22 model (illustrated) combines 35 standard sizes in one precision-engineered wood bit, 1/4" to 3". No. 21 lets you dial 19 standard sizes, 1/4" to 1 1/4". Get an Irwin Micro-Dial soon.

Irwin Screw Starter

Marks hole, starts hole, threads hole for screw to easily enter wood and non-metal materials. Handiest hand tool in years for housewife and handyman.

® Registered U.S. Patent Office

IRWIN® every bit as good as the name
at Wilmington, Ohio 45177, since 1885

PM LOOKS AT HANDLE REPAIR KIT



Maul handle replacement (left) has fiberglass core and a molded polypropylene body for superior shock absorption. The unbreakable handle stops fracture from overstrike (above).

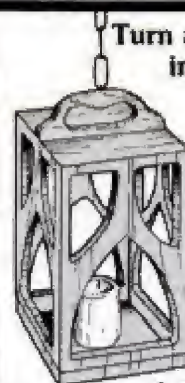
A new handle replacement system for hammers, sledges, hatchets, mauls and axes is good news for anyone who has ever tried fitting a wooden handle replacement. Mix epoxy glue in an unopened plastic pouch by working with fingers. Snip corner and squeeze glue like toothpaste into voids in tool's eye. No wedges are required. Kits are at hardware outlets from Decker Manufacturing Co., Keokuk, Iowa 52632. Prices are \$3.50 to \$10.—J.P.



Punch out broken handle from tool's eye; apply caulk to handle shoulder.



Lean tool against wall when pouring epoxy; drive a nail to support the head.



Turn a part-time hobby into big profits

You'll pocket real profits making handsome coach lanterns like this ...and dozens of other popular wood gifts.

NOW !
Earn up to \$15 an hour making popular custom wood products

Now, a Free Information Kit tells how you can make \$5, \$10, even \$15 an hour or more spare-time in your own basement or workshop.

A patented, easy-to-use woodworking tool—the famous Shopsmith Bryco Router Arm—lets even beginners quickly turn out a big volume of beautiful wood products and gifts that sell themselves on sight, at handsome profits.

You'll have fun making and selling deep-etched custom signs for home or business, beautiful picture frames, decorator wall plaques, coach lanterns, serving trays, trinket chests, and dozens of other popular, fast-selling items. You can even start a money-making furniture repair and restoration business if you like. It's the perfect way to turn an enjoyable and satisfying hobby into extra cash while being your own boss! **FREE BUSINESS-ASSISTANCE PLAN**

Mail the no-obligation coupon below to receive, by mail, a Free Information Kit, "Your 'Rout' to Woodworking Profits," that tells you all about this profitable opportunity. We help you get started with a complete, thoroughly researched "Blueprint for Success" that includes advertising materials, project ideas and patterns, production aids...the "works". And, we'll help your business grow by sending you a constant flow of new project plans and business-building ideas.

Don't miss getting the free facts about this unusually good money-making opportunity! Mail the coupon today!

Mail to: Shopsmith Bryco Router Arm Div.
Shopsmith, Inc., Dept. 1996
750 Center Dr., Vandalia, OH 45377

FREE FACTS KIT

SHOPSMTIH, Dept. 1996
750 Center Drive
Vandalia, Ohio 45377

Please mail me your Free Information Kit, "Your 'Rout' to Woodworking Profits" that tells how I can make money in my spare time with the patented Shopsmith Bryco Woodworking Router Arm — including the details of your complete "Business Plan". I understand there's no obligation, and no salesman will visit.

Name _____

Address _____

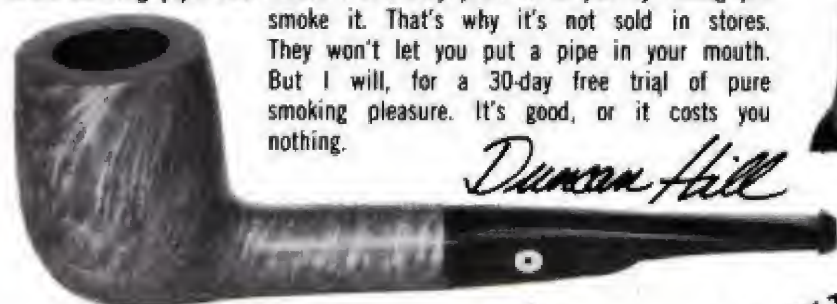
City _____

State _____ Zip _____

Cabinetmakers and professional woodworkers inquiries welcome.

It took me 30 YEARS to develop THE PERFECT PIPE... now you can smoke it FREE FOR 30 DAYS!

If you have searched, as I have, to find the perfect pipe, the one that smokes cool, sweet and clean from your very first puff, your search is over! Our newly patented AEROSPHERE Pipe Smoking System combines tiny internal chambers and proportioned fresh air to keep nicotine, tar and sludge from reaching your mouth, and eliminate tongue bite. It's the finest smoking pipe ever made. I can only prove it to you by letting you smoke it. That's why it's not sold in stores. They won't let you put a pipe in your mouth. But I will, for a 30-day free trial of pure smoking pleasure. It's good, or it costs you nothing.



Duncan Hill

NO BREAKING IN!

THE SECRET IS THE PATENTED AEROSPHERE CHAMBER!

NO FILTERS! NO INSERTS!

To look at this handsome Algerian briar pipe with its unique tiny brass circle, you'd think it was just another of those good-looking pipes you've been buying, and trying, for years. You'd never guess that hidden within its bite-proof Ebonite stem is the secret that makes this the greatest smoking pipe you've ever had in your mouth.

WHAT IS THE SECRET?

It's as old as science itself! Yes, the patented AEROSPHERE is an adaptation, in miniature, of scientific principles based on condensation and ventilation. Condensation, in the inner chamber of the AEROSPHERE, to trap moisture, tar and nicotine, plus a measured puff of air that draws the heat and bite away from your smoke. It sounds simple, but it's the result of intricate scientific achievement that you really can't believe until you light up my pipe in your mouth and take your first smooth, clean, mellow puff!

COOL AND DRY, SMOKE AFTER SMOKE!

It's true, as often as you smoke your AEROSPHERE, pipeful after pipeful, from first to last. No breaking in, no tongue bite, no gurgling moisture! And all without inserts or filters or constant cleaning. You'll never know the true pleasure of

pipe smoking until you've tried the AEROSPHERE. And you'll find it the most comfortable pipe you've ever held in your mouth.

PROVE IT YOURSELF WITH MY 30-DAY FREE TRIAL

It's the only way to learn that what I say is true. And if you think I'm taking a big risk in making such a PROVE-IT-YOURSELF FREE OFFER, I'm not! Because I know that once you try our pipe, and keep on smoking it for 30 days, you'll never want to be without it. This is the only way I've ever offered my AEROSPHERE pipe. It's the way so many smokers have finally found the perfect pipe they've always dreamed of smoking.

Do this right now. Mail the coupon. Send **no money**. Just your name and address. I'll send you a brochure showing our handsome, hand-fitted and hand-finished pipe styles so you can select the one you'd like to try. Then you can look forward to your 30 days of trying out my AEROSPHERE pipe and finding out how truly great pipe smoking can be. All without risking more than the stamp to mail this coupon. Do it today.

DUNCAN HILL, LTD., Dept. 16B0
70 West Drive
Hartville, Ohio 44632



WE FOUND THE PERFECT PIPE WITH THE 30-DAY FREE TRIAL

"Many Thanks for sending me your Duncan Hill pipe. I work outside and I like to hunt and fish. For me a good pipe is necessary. No filters or inserts or things like that. Folks around here are about the same, too. They just want a good pipe to smoke. It's Duncan Hill for me!"

Robert R. Scates,
Kokomo, Ind.

"Bravo! At last, I've found a pipe that's perfect. It's the quality of the Duncan Hill pipe that I like. All the other pipes I own just sit and I reach for my Duncan Hill for pure quality of pipe smoking. My check is attached. Please send me another in smooth finished walnut."

John L. Gard,
Mountain View, Cal.

"I've spent hundreds on imported pipes, as well as so-called 'cooled' pipes sold locally. Now, I don't even use them. You said I should smoke my Duncan Hill all the time, and that's the way it's turned out. Thanks for inventing the best pipe in the world."

Millard F. Crank-Landis,
Boston, Mass.

"When I ordered my Duncan Hill pipe I just wanted a good smoke. It seemed to me that the Duncan Hill pipe was a better idea, and it is! You've really put a lot of thought into it. Your pipe is perfect. Thank you for the smoothest, coolest smoking pipe I've ever had."

William A. Young,
Oak Brook, Ill.

MAIL TODAY FOR 30-DAY FREE TRIAL

Duncan Hill, Ltd., Dept. 16B0
70 West Drive
Hartville, Ohio 44632

OK, Mr. Hill! Mail me your brochure so I can select the pipe style for my 30-day free trial.

Name

Address

City

State Zip

Yes!
TWO!
for all week
and
all weekend



Working Man's

Body Vest

THE "MACHO" COLD REMEDY

2 for only 12⁹⁵

THAT'S RIGHT! 2 for 12". The extra protection the active outdoor man needs! Whether you work hard or play hard, you've got to stay warm and comfortable. Haband's Body Vest is that protection!

THREE LAYERS WARM!

- 100% textured nylon shell
- 100% nylon tricot lining
- 100% polyester fiberfill
- LARGE ARM HOLES
- 3 BIG POCKETS
- BIG HEFTY ZIPPER
- WASH and WEAR
- WATER REPELLANT



HABAND

A family business with 54 years experience in direct mail service! For fast, reliable service, please send your order to Duke Habernickel, Pres.

HABAND COMPANY

265 N. 9th St., Paterson, NJ 07530

Gentlemen: Please send me _____ Body Vests for which I've enclosed \$_____ plus \$.65 toward postage and handling.

Or To Charge It: ☐ VISA ☐ Master Charge

Exp. date ____ Acct. # _____

GUARANTEE: I understand that if upon receipt I do not choose to wear the vest(s) I may return them within 30 days for a full refund of every penny I paid Haband. 780-302

Name _____

Street _____

Apt. # _____

City/State _____

Zip _____

Body Vests 2 for 12⁹⁵

AVAILABLE SIZES

S	M	L	XL	XXL*	XXXL*
34-36	38-40	42-44	46-48	50-52	54-56

*Please add \$1 per vest for XXL & XXXL

COLOR	HOW MANY	WHAT SIZE
NAVY a		
BROWN b		
GREEN c		

2nd MOST IMPORTANT TOOL FOR EVERY WOODWORKING SHOP...

VERSATILE **W&H** MOLDER- PLANER

Second only to a saw... molds, planes, rabbets.

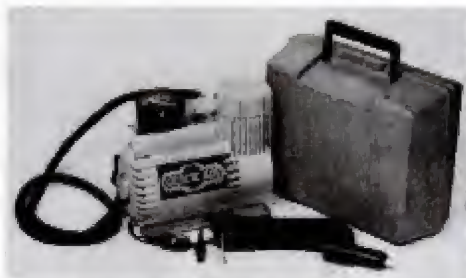


FROM \$345

- Master Charge
- BankAmericard

SEND FOR FREE BROCHURE 2G

WILLIAMS & HUSSEY MACHINE CORP.
Dept. 2E, Milford, New Hampshire 03055

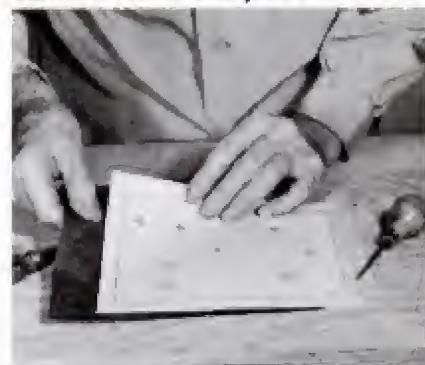


12 V AIR COMPRESSOR — WITH BUILT-IN GAUGE...160 PSI

QUICK-AIR pumps air faster to higher pressure than other portable units. Plugs into veh. cigarette lighter socket. Built-in gauge shows pressure as you inflate tires, RV water systems, steel or rubber air shocks & other inflatables. Complete with 3' air hose, 15' power cord, on/off switch & 2 inflating adapters all in sturdy carry case. Money back guar. TO ORDER ITEM #101A send check or MO for \$49.95 + \$3.95 ship (CA res. add 6% tax) OR include VISA or M/C acct # & exp. date. Send to OMEGA, Dept. 81-PM, 733B Lee St., Des Plaines, IL 60016

HINTS FROM READERS

Carbon transfers punch marks



When transferring hole positions from a pattern to wood, place carbon paper under the pattern, carbon side toward the wood, and use a punch or scriber. Sharpen the punch tip and tap it with a hammer. Pattern can be used many times; yet carbon will clearly transfer the marks.

—Walter E. Burton

C-clamp is holder



A large C-clamp fastened between top and second steps of a stepladder provides a handy hanger for a hammer.

—Ken Patterson

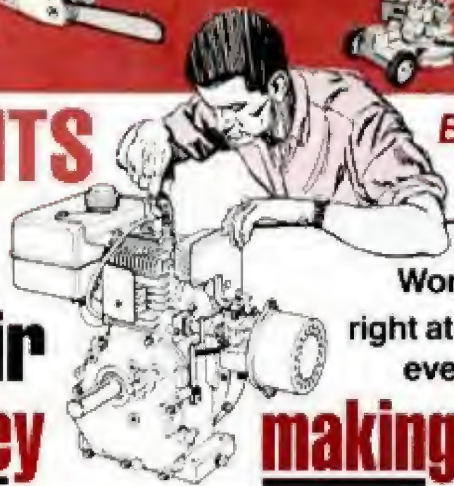
Carrying small drill bits



The only complaint I have with small bit cases is that bits fall out as case is opened. To stop this, embed bits in clay. —Frank Day



Get in on the **PROFITS** in **SMALL ENGINE** service and repair **Start your own money**



BEAT INFLATION!

Cash in on the huge demand for small engine repair.

Work part time, full time right at home - we help you every step of the way.

making business!

In just a short time, you can be ready to join one of the fastest growing industries in America...an industry where qualified men are making from \$10.00 to \$15.00 per hour...and that's just for labor. Parts, engines and accessories add even more to the profits.



Because the small engine industry has grown so quickly, an acute shortage of qualified Small Engine Professionals exists throughout the country. In fact, it's not unusual for a good small engine man to be three to four weeks behind in the summer and at least a week behind in the winter. When you see how many small engines are in use today, it's easy to understand why qualified men command such high prices—us much as \$17.50 for a simple tune-up that takes less than an hour!

46-million small engines are in service today!

That's right—there are over forty-six million 2-cycle and 4-cycle small engines in service across the U.S.A. That's the official count from the Engine Service Assn., and new engines are being built at a rate of one-million per month! With fully accredited and approved Belsaw training, you can soon have the skill and knowledge to make top money servicing these engines. Homeowners and businessmen will seek you out and pay you well to service and repair their lawnmowers, tillers, edgers, power rakes, garden tractors, chain saws, mini-bikes, go-carts, snowmobiles, generators, snowblowers, paint sprayers...the list is almost endless.



No experience necessary.

You don't have to be a 'born mechanic' or need prior experience. If you can read, you can master this profitable trade right at home, in your sparetime, without missing a single paycheck. Lessons are fully illustrated—so clear you can't go wrong.

You receive trade secrets and business plans

We guide you every step of the way, including tested and proven instructions on how to get business, what to charge, how to get free advertising, where to get supplies wholesale...all the "tricks of the trade"...all the inside facts you need to assure success right from the start.

Increased Income

"I've had about 8 years experience repairing small engines...but repairs were only minor...until I started the Belsaw Course."



Walter H. Strick
Campbell, California

With our famous 'learn-by-doing' training method, you get practical 'hands-on' experience with specialized tools and equipment that you'll receive with your training *plus* a brand-new 4HP engine—all yours to keep!

SEND FOR FREE FACTS!

You risk nothing by accepting this offer to find out how Belsaw training can give you the skills you need to increase your income in a high-profit, recession-proof business of your own.

Just fill in and mail coupon below (or send postcard) to receive full information and details by return mail. **DO IT TODAY!**



BELSAW INSTITUTE OF SMALL ENGINE REPAIR
510F Field Bldg., Kansas City, MO. 64111

There is NO OBLIGATION and NO SALESMAN Will Call—ever!

BELSAW INSTITUTE, 510F FIELD BUILDING
KANSAS CITY, MISSOURI 64111

☐ YES, please send me the FREE booklet that gives full details about starting my own business in Small Engine Repair. I understand there is no obligation and that no salesman will call.

Name _____

Address _____

City _____

State _____ Zip _____

Accredited Member National Home Study Council

Send **TODAY**
for this
fact-filled
FREE
BOOKLET!



Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own **PLUS** complete details on our **10-Day NO RISK Trial Offer!**

You get all this Professional equipment with your course—and it's Yours to **KEEP!**



PLUS... 4 HORSEPOWER CLINTON ENGINE... YOURS TO KEEP!

World's First and Only Solar-Powered Watch*

Guaranteed to outperform any watch sold today... or it costs you nothing!

The Sunwatch; acclaimed as the most accurate, most versatile, most rugged watch ever made.

Various features make all other watches obsolete:

- Clearly visible by day or night
- Natural side-view window simplifies reading
- 100% solar-powered, you never replace batteries
- No resetting of calendar, not even in leap years

Space age accuracy

Now you'll never worry about accuracy again. Because the Sunwatch will keep you on time for the rest of your life. (Accurate to within 1 sec. per month.)

Solar age efficiency

Miniature solar cells automatically convert sunlight, daylight or ordinary bulb light into usable energy for storage. The solar cells last virtually forever. So you'll never replace a watch battery again.

Programmed for over a century

The built-in computer on a chip will always display the correct time date and month. Also, it automatically adjusts the watch calendar for long and short months, leap years and it's programmed until the year 2100!

Easy to read

The natural side-view display lets you tell the time, day and date without twisting your arm into an uncomfortable position.

Numbers always visible

Four varying light intensities are built into the viewing display, allowing the Sunwatch to adjust automatically to any light. This means you can always read it, even in the brightest sunlight.

10 Display functions

The Sunwatch is capable of displaying the following information: hours • minutes • seconds • months • date • day • leap year • speed calibration • AM/PM indicator • seconds count-off.

Extreme accuracy

Unlike other electronic watches using tuned crystals to control timing accuracy, the Sunwatch incorporates a unique, programmable, microcircuit synthesizer to make it the first watch in history that is accurate to less than 1 second per month. That's 5 times more accurate than the latest quartz Accutron.

The Power Source

Tiny silicon power cells, which are constantly being energized by natural sunlight, daylight or an ordinary light bulb keep the Sunwatch energy storage system charged. Should the watch not be exposed to light, it will continue to operate for months on stored power.

The most indestructible watch in the world
The workings of the watch: solar panels, energy cells, quartz crystal, computer on a chip, etc., are all permanently sealed in a Lexan module. This module is so unique it's protected by U.S. and foreign patents.

Completely waterproof

Leave the Sunwatch in salt water for months. Dive with it in depths up to 750 feet. There are no openings — magnetic slide bars activate all functions. With Sunwatch's exclusive, permanently sealed Lexan module, there are no "O" rings or seals to leak.



Shock resistant to 25,000 G's

You can crash it into a rug-surfaced brick wall at 90 mph with no noticeable effect. Wear it while doing heavy work, exercise or any strenuous activity.

Temperature resistant

Put the Sunwatch in boiling water for 30 minutes, freeze it in a block of ice for a year. Extreme temperatures will not damage your Sunwatch.

Pressure resistant

There are no air spaces inside the Sunwatch. Therefore, it is not susceptible to high pressures such as might be encountered diving to great depths.

The perfect watch for a lifetime

Imagine split-second accuracy for the rest of your life. Sunwatch is a virtually indestructible, beautifully styled, space-age timepiece, and it's available in three exciting finishes: Brushed stainless steel, Gold plated stainless steel, or a Durable black finish on stainless steel. All Sunwatches come with a matching stainless steel band with removable links and adjustable clasp.

Made in the United States

The Sunwatch, designed by Roger Riehl, was being worn by its inventor nearly a year before the first electronic digital watch was even available to the general public. Since that time constant engineering evaluations and design improvements have been made on the Sunwatch to incorporate the latest in digital microcircuit and solar power technology. Thus the Sunwatch today represents state-of-the-art electronics technology. It is built to the same rigid standards practiced by the manufacturer in creating sophisticated computer micro for the U.S. Government and other major users of these components.

* A word about other "Solar Watches"

Roger Riehl, designer of the Sunwatch, states that there is no other completely solar powered watch on the market today. Claims of solar power by other watch manufacturers are based on the use of a small solar cell. Due to their limited size, these cells can be proven, in technical terms, to be of virtually no significant value in extending the life of a watch battery. For this reason, all other so-called "solar watches" must have replaceable batteries. The Sunwatch's power storage system, however, need never be changed and is, in fact, permanently sealed to withstand abuse and the elements.

Unique and memorable gift

Available in a special gift box (see order form) the Sunwatch makes an ideal gift for special holidays, birthdays, graduation, Father's Day, etc. Perfect for business people, commuters, teachers, athletes and sportsmen, who require split second accuracy.

Free custom engraving

At your request, each Sunwatch will be hand-engraved with the name you specify.

Limited Warranty is your protection

The Sunwatch is covered by a 2 year limited warranty issued by Riehl Time Corporation (manufacturers of the prestigious Synchroner 2100) and included with your watch. A copy of the warranty may also be obtained free of charge by writing to Future Concepts, 41 Holiday Park Dr., Hauppauge, NY 11787. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

15 Day no risk trial offer

Order your Sunwatch today and use it for 15 days. Then, if you are not completely satisfied return it for full money back.

CREDIT CARD ORDERS CALL

TOLL FREE 800-845-7252

N.Y. Residents Call Collect 516-822-4550

OR MAIL THIS NO RISK COUPON

Future Concepts 41 Holiday Park Drive
Dept. 342 □ Hauppauge, New York 11787

Please send me:

- _____ Brushed Stainless Steel Sunwatches at \$129.95 each
- _____ Black Finish on Stainless Steel Sunwatches at \$159.95 each.
- _____ Gold Plated Stainless Steel Case Sunwatches at \$179.95 each.
- _____ 24 Hour (Military Time) \$10.00 Additional.
- _____ Gift Boxes at \$4.95 each.

Please add \$3.95 per watch shipping and insurance.
Enclosed is \$_____ Check or Money Order
(N.Y. Residents add appropriate sales tax)

CHARGE IT: (Check One)

- ☐ American Express ☐ VISA (BankAmericard)
- ☐ Master Charge ☐ Diner's Club ☐ Carte Blanche

Credit Card# _____ Bank# _____

Issue Date _____ Exp. Date _____

Signature _____

Name to be engraved _____

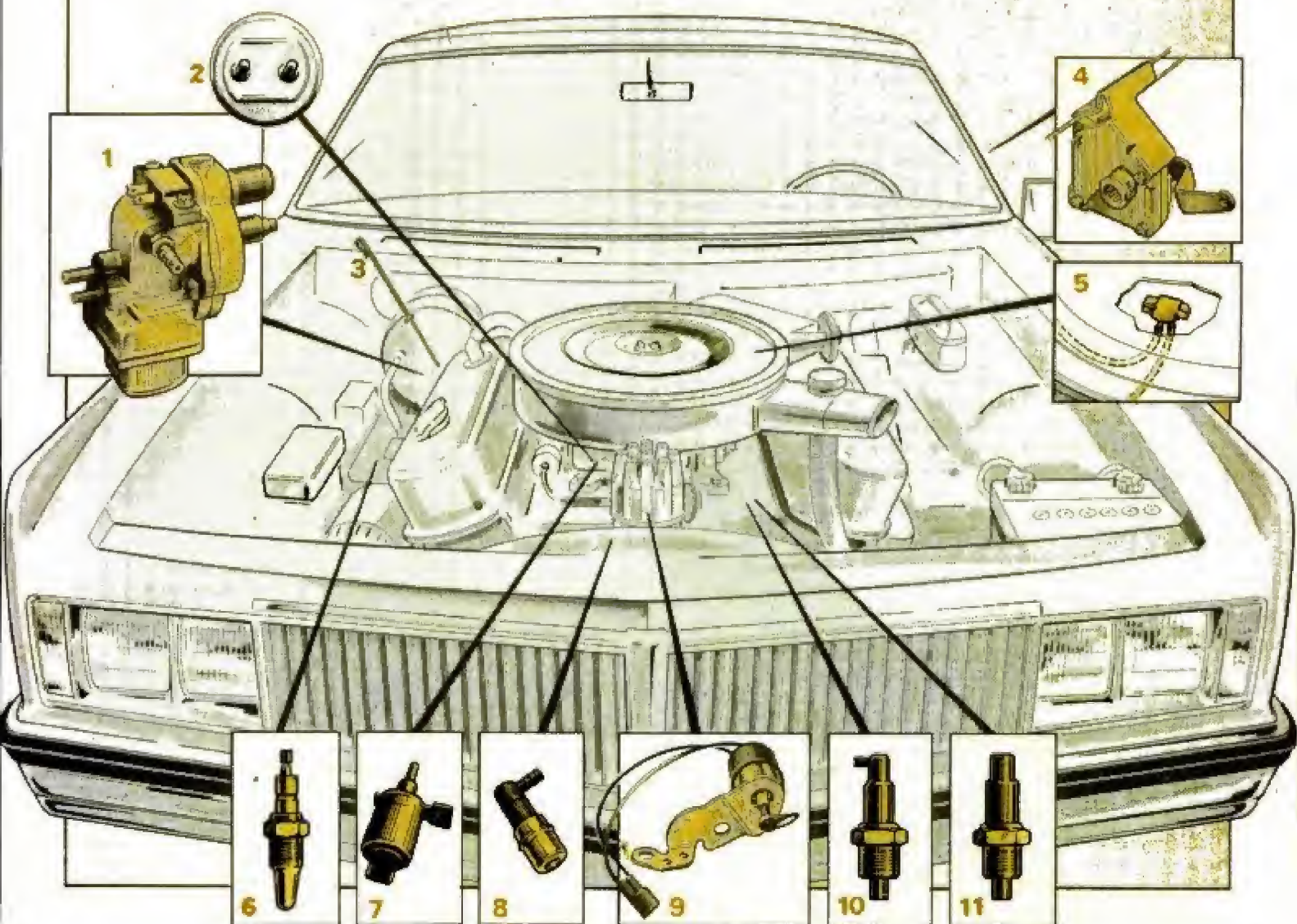
Name _____

Address _____

City/State/Zip _____

How to find, service and replace your CAR'S SENSORS

by Mort Schultz



1 Speed-control sensor in speedometer cable housing. **2** Carburetor-switch sensor. **3** Transmission-fluid-level sensor/dipstick. **4** Height sensor for level-control system on rear suspension. **5** Air-temperature sensor in air-cleaner. **6** Exhaust-gas oxygen sensor. **7** Throttle-positioner sensor. **8** Coolant-temperature sensor (in water-pump housing). **9** Start and run sensors in distributor. **10** Coolant-temperature sensing switch. **11** Oil-pressure sensing switch.

Depending on the make and model of your car, it has various sensors, each doing a particular job. How often have you given them a thought? If something goes wrong with a system a sensor serves, thinking "sensor" may help you avert time-consuming, frustrating trou-

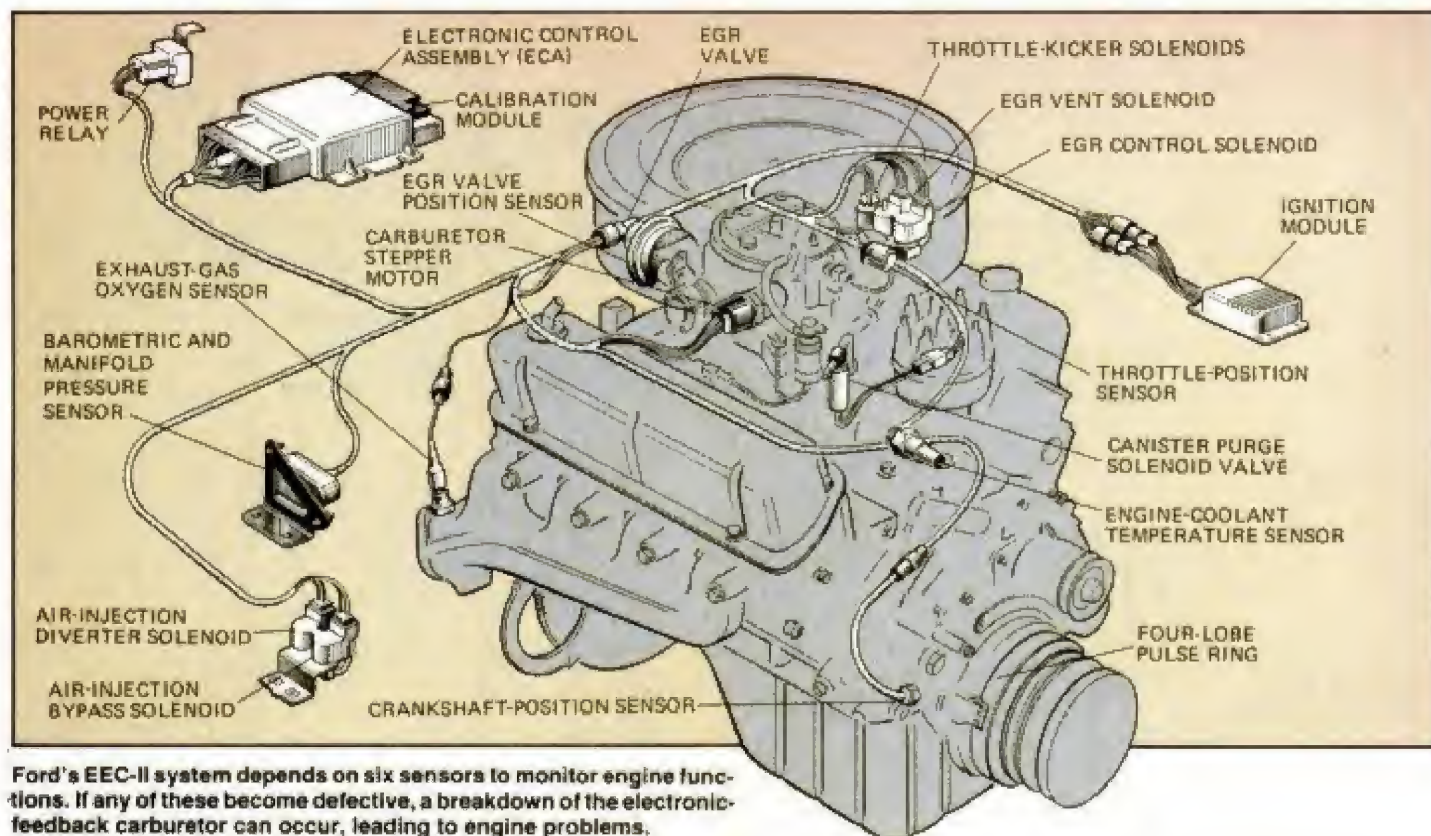
bleshooting and, possibly, a needless repair. The cause of trouble is frequently a malfunctioning sensor.

Engine-temperature monitor

Let me give you some examples of the problems you can avoid by thinking "sensor." Consider, first, the en-

gine-temperature sending switch.

This sensor is screwed into the engine to measure temperature. It transmits the "message" to a gauge to let you know when the engine overheats. The sensor does this by using a variable resistor, which can fluctuate in value as the tem-



Ford's EEC-II system depends on six sensors to monitor engine functions. If any of these become defective, a breakdown of the electronic-feedback carburetor can occur, leading to engine problems.

perature increases and decreases.

When the engine is cold, the resistance of the sensor is high, which restricts electric current to the temperature gauge on the dashboard. This results in a low (or no) temperature indication. As the engine gets warm, the sensor resistance value decreases, and electric current is permitted to flow to the gauge. The temperature indicator needle rises.

Suppose, one day, the temperature indicator needle on the dash shoots up. Some people think the worst. They may even indiscriminately replace the radiator or water pump.

But the smart approach, instead, is to think "sensor" unless, of course, coolant is actually boiling over. If the engine isn't really overheating, the malfunction you're looking for is in the temperature-indicator circuit, quite probably with the temperature-sensing switch.

To test the switch, unscrew it from the engine and check resistance with an ohmmeter. (Many mechanics simply replace the sensor without testing. It's not an expensive part.) If the resistance reading isn't as specified in service data (usually 100 to 200 ohms, give or take a few), replace the sensor.

Sensors affect engine

The engine-temperature sensing switches are simple to work with, but what about the sensors serving modern, highly complex automobile electronic systems—for example,

the exhaust-gas oxygen sensor of the electronic feedback carburetor system? The oxygen sensor is in the same ballpark as the engine-temperature sensing switch, except for one thing: If the oxygen sensor fails, it doesn't simply cause a gauge to show a malfunction. It disrupts the electronic-feedback carburetor system. Consequently, engine operation is affected and, as a result, the engine may:

- Detonate.
- Stall when cold or warm.
- Idle rough when cold or warm.
- Miss.
- Hesitate.
- Surge.
- Have poor gasoline mileage.
- Be hard to start when cold or warm.
- Emit an objectionable exhaust odor.

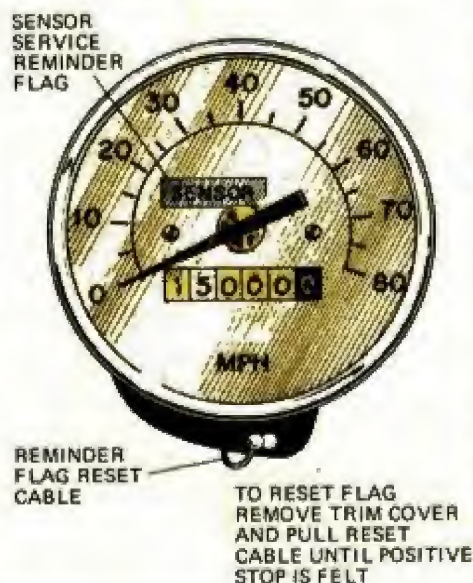
Electronic-feedback carburetors

Few people now have electronic-feedback carburetors in their cars. The system is the newest one adopted by domestic carmakers to help meet the rigid clean-air standards for the 1980s. However, most cars will eventually have this system.

Credit for pioneering the electronic-feedback carburetor system here belongs to Volvo. The company applied the Bosch development to its 1977 California cars. In Volvos, it's used in conjunction with fuel injection and it's called Lambda-sond. Now, every American manufacturer has adopted a version of the system, which also requires use of a three-way catalyst.

Electronic-feedback carburetors started appearing on some U.S. models in 1979. Its use is more widespread on 1980 models. Next year, it will be standard on most models.

The development of electronic-feedback carburetors has resulted in new "letter-talk" used by manufacturers. Chrysler calls its unit EFC for Electronic-Feedback Car-



The exhaust-manifold oxygen sensor must function properly on cars equipped with the new, electronically controlled carburetors. Because of this, a warning light on the dash goes on after a specified number of miles, indicating a replacement for the sensor must be installed.

buretor. Ford calls its system EEC for Electronic Engine Control. The General Motors system is referred to as C-4, which shouldn't be confused with the Ford automatic transmission of the same name. The GM C-4 is taken from the four initial C's of Computer-Controlled Catalytic Converter. American Motors uses the Ford system on six-cylinder engines and the GM system on four-cylinder engines.

The purpose of the electronic-feedback carburetor is to keep the air/fuel mixture at a precise ratio. By keeping the ratio within narrow limits, the three polluting agents—hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx)—created when fuel is burned can be treated by a newly advanced catalyst system, known as a three-way catalyst.

The new catalytic system does a more effective job of controlling emissions than the older catalytic system. As the older converter does, the new one converts HC and CO to carbon dioxide (CO₂, the same ingredient used in soda pop) and water vapor, but it also converts NOx into harmless nitrogen and oxygen, which the old converter doesn't do.

The older catalytic converter contains platinum or palladium and platinum. So does the new converter. But the new converter also contains rhodium, which does an effective job in breaking down NOx. Cou-

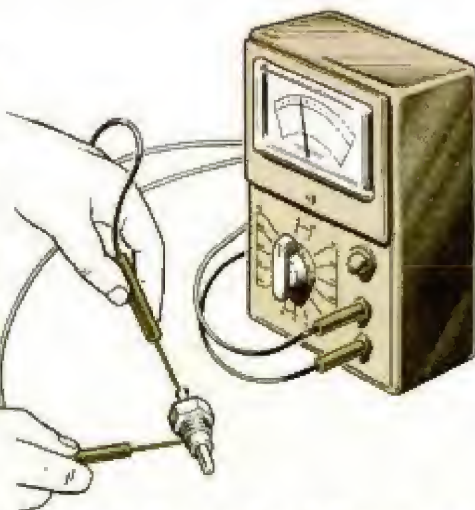
pled with the exhaust-gas recirculation (EGR) unit, the three-way catalytic converter is expected to remove, once and for all, NOx as a threat to the environment. (Incidentally, Chrysler and Ford use two catalytic converters, one to treat HC and CO and one to treat NOx. GM incorporates all functions into one converter.)

And what's at the heart of this sophisticated three-way catalytic system? A sensor, that's what—specifically, a sensor that measures the oxygen content of exhaust gas, compares it to the oxygen content of the atmospheric air and then transmits an electronic signal concerning this ratio to the carburetor control unit. Upon receiving the signal, the carburetor adjusts the air/fuel ratio to keep exhaust gases within the narrow bounds necessary for effective catalytic treatment of emissions.

As you can see by examining the illustrations of the EFC, EEC and C-4 systems accompanying this article, the oxygen sensor is not the only sensor these systems employ. A breakdown of any sensor can cause a breakdown of the electronic-feedback carburetor and lead to an engine problem.

Testing oxygen sensors

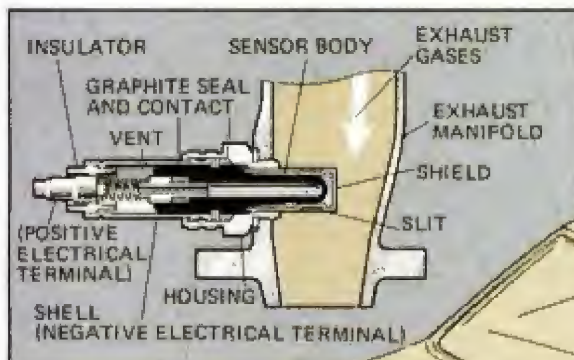
Therefore, when something goes amiss, think "sensor." If the system has a sensor, or sensors, check it, or them, before making other repairs.



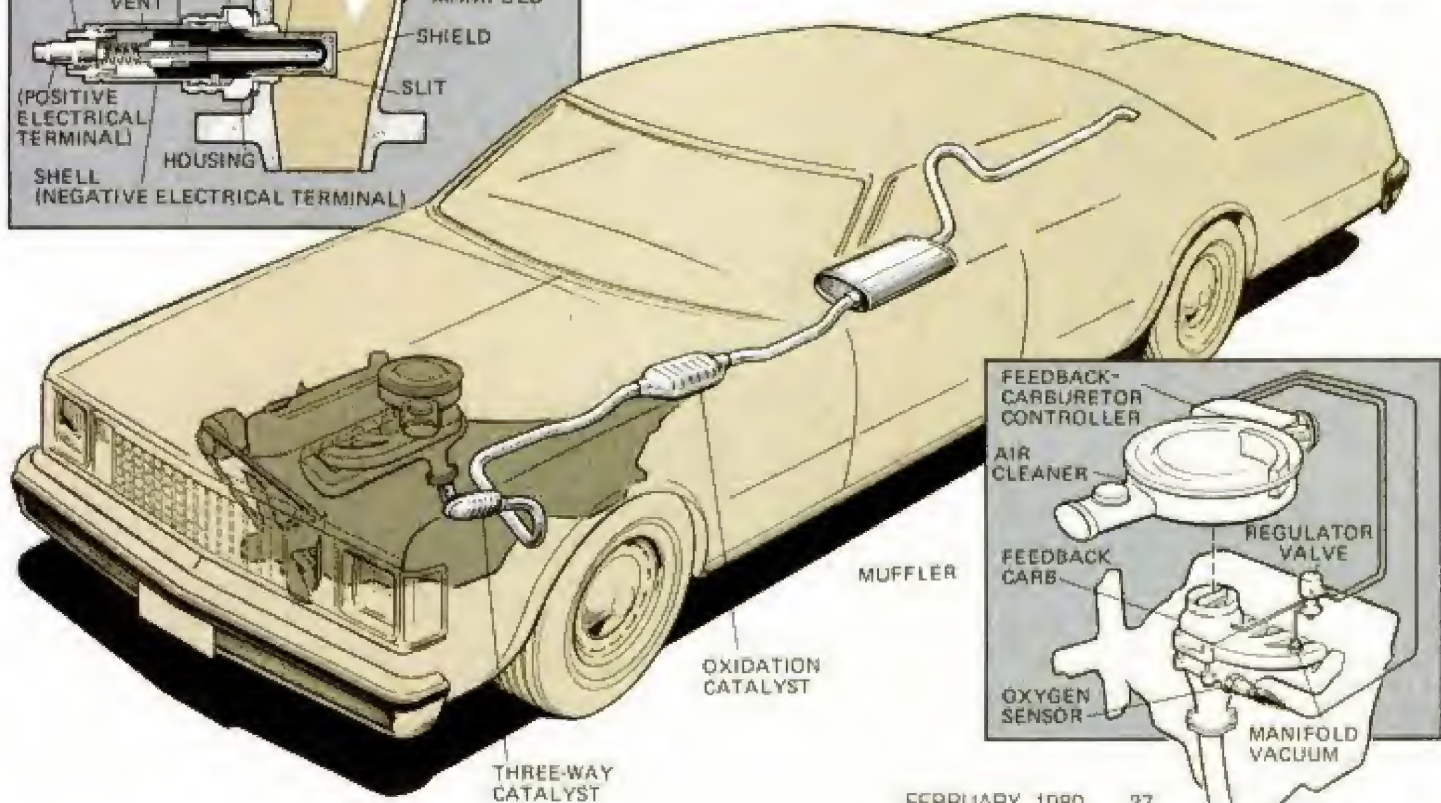
Ohmmeter is used to test sensors with electric resistance elements. The temperature-sensing switch, for example, usually has resistance of 100 to 200 ohms.

Testing the electronic-feedback carburetor sensors is within the expertise of advanced Saturday mechanics. However, you have to use specific testing procedures designated for your car model. Therefore, you need a service manual. Manufacturers of domestic cars are making manuals available for a reasonable charge.

To demonstrate the relative ease involved in testing a sensor, let's take as an example the Ford EEC exhaust-gas oxygen sensor. To test it, disconnect the wiring harness from the sensor.



Chrysler's EFC system uses two catalytic converters (as does Ford's EEC): a regular oxidation catalyst controls HC and CO, a three-way catalyst controls NOx. Sensor (left) compares oxygen content of exhaust to that in atmosphere, signals electronic-feedback carburetor (below), insuring correct air/fuel ratio.



Connect the positive lead of a voltmeter to the sensor connector wire and connect the negative lead to ground. Start the engine and let it warm up to reach normal operating temperature.

Now, with the engine idling, a reading of 0.2 to 0.5 volt should show on the voltmeter low-voltage scale. Push down on the cold-start enrichment rod of the carburetor. Voltage should be 0.6 to 1.1.

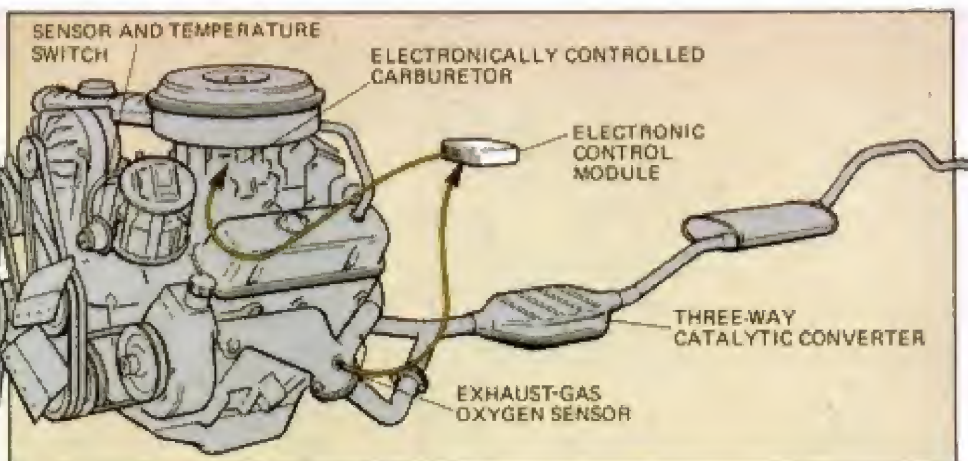
If voltage is not within the specified ranges, the exhaust-gas oxygen sensor is faulty and should be replaced.

By the way, the exhaust-gas oxygen sensor is so important that a car with an electronic-feedback carburetor is equipped with a warning that displays itself every 15,000 miles to tell the driver to replace the sensor. The warning will not appear if the sensor fails before 15,000 miles.

Monitoring lean-burn engine

Let's take another example of the simplicity involved in resolving a problem caused by a malfunctioning sensor. In 1976, Chrysler introduced its Electronic Lean Burn system to control exhaust emissions by allowing the engine to burn a leaner-than-usual fuel mixture.

Keeping the mixture at the leaner



GM's C-4 (Computer-Controlled Catalytic Converter) system has a single three-way catalyst that—like other three-way units—only functions properly if the engine runs with a precise air/fuel ratio. A sensor in exhaust system measures oxygen and signals control module, which can perform carburetor adjustments as car is driven.

level eliminates several items of emissions-control hardware. They include the EGR system, orifice spark-advance control system, air pump, and conventional distributor vacuum advance.

To monitor constantly changing variables within the engine, the Electronic Lean Burn system uses six sensors: coolant temperature, ambient-air temperature, throttle position, carburetor switch, and vacuum and pickup coil. These send "messages" to the spark-control computer, which determines instantly when the fuel mixture is to be ignited.

In other words, ignition has to be rapid and precise to attain smooth burning of the lean mixture. Conventional mechanical methods of controlling ignition timing are too slow, whereas the electronic methods aren't.

Suppose a Chrysler with an Electronic Lean Burn system suddenly starts using an excessive amount of fuel and exhibits a high idling speed. Fault often lies with the coolant-temperature sensor, which (as the diagram on page 35 points out) is on the water-pump housing. Testing this sensor requires a simple ohmmeter, not a sophisticated digital analyzer. You don't even have to take the sensor out of the car.

The ohmmeter is connected to ground on the engine and to the sensor terminal. With the engine cold, there should be continuity. If not, replace the sensor. With the engine warmed to normal operating temperature, there should be no continuity. If continuity is present, replace the sensor.

Air cleaners have sensors, too

Most cars have thermostatic air cleaners. These, too, have a sensor that can cause a problem.

Suppose there is a sudden increase in fuel consumption. As you know, there are many causes for this, but one cause, frequently overlooked, is a thermostatic air-cleaner damper door that binds. And what's the main reason for this? A defective temperature sensor!

The sensor controls a vacuum motor, which closes the damper door when the engine is cold and opens the damper when the engine is warm. To test for a bad air-cleaner temperature sensor, the engine has to be completely cold.

Remove the air-cleaner cover and place an accurate thermometer near the sensor. A photographic thermometer having a metal housing and long metal stem, or one like it, is usually accurate enough for this simple test.

Wait for the thermometer to stabilize, which takes five or 10 minutes. Then, reinstall the air-cleaner cover and start the car's engine, letting it idle.

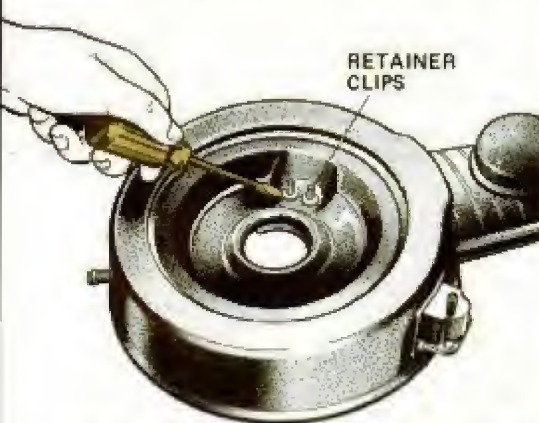
The damper door should close over the snorkel at once. If it doesn't, the linkage or vacuum motor is at fault. As soon as the damper door starts opening, remove the air-cleaner cover and read the thermometer. The temperature should read between 95° and 135° F.

If the temperature exceeds this reading and the damper door hasn't opened, replace the sensor, which most likely is defective.

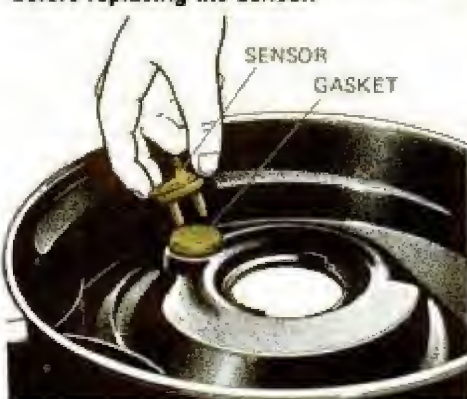
The thermostatic air cleaner temperature sensor is held by retaining clips. Remove the air cleaner and turn it upside down. Pry retaining clips off the sensor with a screwdriver to remove the sensor.

Sensors in most other areas of a car are screwed in place. They can be removed easily by simply engaging the hex of the sensor with an appropriate wrench.

PM



If damper door on air-cleaner housing doesn't open between 95° and 135° F., sensor must be replaced. To remove, pry off retaining clips with screwdriver. Be certain that the gasket (below) is in good condition before replacing the sensor.



A NON-TECHNICAL LOOK AT THE TECHNICAL ADVANTAGES OF USING STP GAS TREATMENT

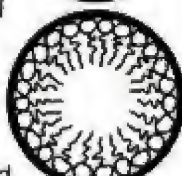
It all starts with this wonderful chemical called Alkylhydroxybenzylpolyamine.

Fancy name for something that looks like a balloon on a string. But, as the primary active ingredient, it does two important things in your car's fuel system:

First, it helps remove water from your gas tank by surrounding droplets of water, suspending them in your gas so they can pass harmlessly through your fuel system.



Second, it helps prevent grunge like gum and varnish from sticking to metal surfaces of the fuel system in two ways:



By coating the metal surfaces of the fuel system and by surrounding the gum and varnish to keep them from getting a toehold. This helps keep your carburetor clean and that helps maintain peak engine performance.

Still with us?

So far, all you've got to remember is that STP Gas Treatment fights back against bad guys in your fuel system.

Now for the second thing to remember: All this isn't fiction. It's fact. Results proven in scientific tests. For instance:

FIGHTS RUST.



These two steel bars were both soaked in the same gas plus water. Only difference? The gas used with the bar on the right contained STP Gas Treatment.

FIGHTS WATER.

Water causes more than rust. It can freeze, too. Brrrr! Regular use can lessen the likelihood of gas line freeze. Tests proved STP Gas Treatment increases the emulsification of water and that means it helps water get through your system, out your exhaust.

FIGHTS CARB DEPOSITS.



Some carburetor openings are tiny enough to become restricted by gum and varnish, which can rob your engine of efficiency. We put clean metal sleeves in 28 engine

tests. Without us (left) nasty formations developed. With us (right) sleeves came out much cleaner. Take your pick.

FIGHTS VALVE DEPOSITS.



For this test, we matched up six new cars in three matched pairs. After only 12,000 miles, look at the difference that can develop in valve deposit formation. (We're on the right.) That stuff on the

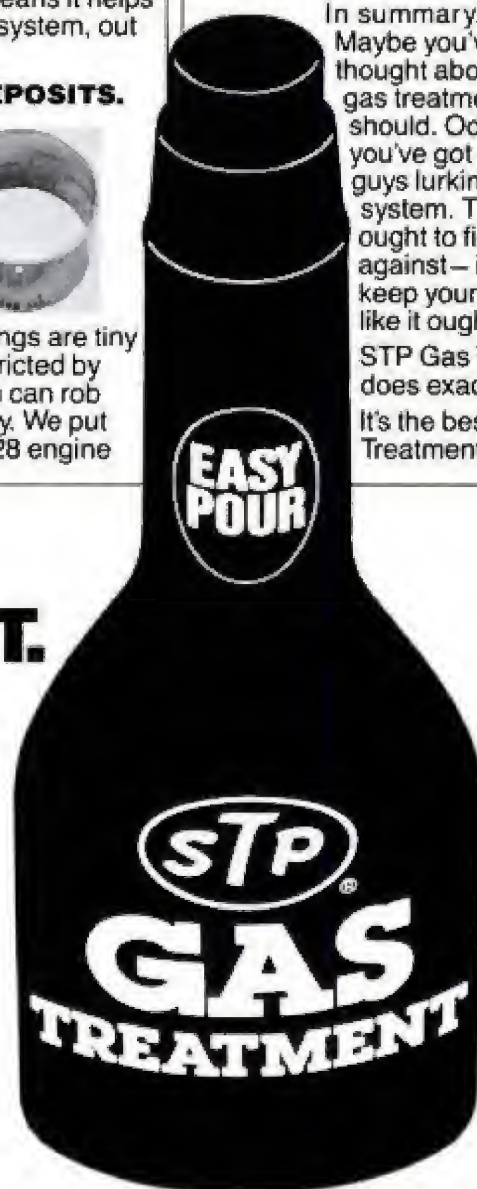
left? Would you want that in your car?

In summary. Maybe you've never thought about using a gas treatment. Well, you should. Odds are, you've got some bad guys lurking in your fuel system. Things you ought to fight back against — if you want to keep your car running like it ought to.

STP Gas Treatment does exactly that.

It's the best selling Gas Treatment in America.

FIGHT BACK! WITH STP GAS TREATMENT.



HOMEOWNERS' CLINK

QUESTIONS ANSWERED

Extra heat

I have a built-in metal fireplace. Behind the front brick veneer and in the area that encloses the fireplace is wasted warm air.

I was wondering if there's a chance I could connect this "compartment" to my regular warm-air heating plenum, to transfer the heat to other rooms. I'd use proper filters, of course.—Dennis Schimming, Houston.

My advice is not to tamper with the area surrounding the rear and sides of your zero-clearance fireplace.

Although it may appear to be a waste of heated air, the risk of introducing a fire into your air-distribution system isn't worth the trouble. You may also negate your fire insurance if you should make this alteration.

Insulation comparison

I recall reading somewhere that rock wool has a higher R-value per inch than fiberglass. If this is true, why isn't rock wool available anymore? Also, what are the R-values of various insulating materials?—W. Kostellic, Granville, Ill.

One of the places you could have read about R-values was in *Insulation: How Much Is Enough?* (page 132, Sept. '78). Below are R-values as listed in the article (Table 1). The higher the number, the more effective the insulation.

R-Values for various thicknesses of insulation

TABLE 1

Insulation	Maximum R-Value (per inch of thickness)
Vermiculite	2.08
Glass fiber loose fill	2.1-2.4
Rock wool loose fill	2.7-3.2
Cellulose	3.1-3.8
Glass fiber blankets/batts	2.7-3.7
Rock wool blankets/batts	3.1-3.6
Urea formaldehyde	4.1
Polystyrene, polyurethane	6.25

TABLE 2*

R-Value	Batts or blankets		Loose and blown fill	
	Glass fiber	Rock wool	Glass fiber	Rock wool
R-11	3½"	3"	5"	4"
R-13	4"	3½"	6"	4½"
R-19	6"	5"	8½"	6½"
R-22	7"	6"	10"	7½"
R-26	8½"	7"	12"	9"
R-30	9½"	8"	13½"	10"

*Source: Department of Energy.

I've also listed inches of insulation required to attain various R-values between R-11 and R-30, for both glass fiber and rock wool (Table 2). I prefer this chart as, depending upon where you live, it could cost less to add extra glass fiber for the same R-value in rock wool.

Rock wool is available. Write: Rock Wool Industries Inc., Premium Brand Insulation, Box 5170, Denver, Colo. 80217, for a distributor near you.

Carpet-clearing hinge

I was told that there is a type of hinge that will raise a door to help clear the carpet, when the door is opened. The door must be flush when closed.—Eli Glumac, Mechanicsburg, Pa.

The hinge you're looking for is called a rising butt hinge. It is manufactured by Ball and Ball, Exton, Pa. 19341. By studying the photo,



Rising butt hinge lets door swing over a plush carpet. Right-hand hinge is shown.

you can see how opening the door will also raise it.

In brass, a 3 x 2¾-in. set is \$42.90 per pair; a 4 x 2¾-in. set is \$53.75 per pair. In aluminum a 3 x 2¾-in. set is \$26.10 per pair; a 4 x 2¾-in. set is \$29.75 per pair. Postage is \$2 per pair.

When you are ordering, specify a right-hand or left-hand hinge. To tell which type hinge you need, stand with your back to the door, so it swings toward you when opened. If the hinges are on your right, they are right-hand hinges.

Overtreated wood?

For 16 years we have struggled with the 6x14-ft. deck on our church par-

sonage. When it was new we stained it with several coats. Finally, as a last resort, we painted it. Nothing we have tried will adhere to the wood. The paint seems to be oily on the wood side when peeled back.

Besides the fact that it is an eyesore, we are constantly replacing wood that is rotting, because the deck has no protection from the weather.

Someone said our wood may have been "over" treated. Is that possible? Will we have to tear it all down and start over?—James E. Conner, Belmont, Mich.

The initial stain and paint jobs most likely didn't cover the sides and bottom of the wood decking, allowing moisture to penetrate the pores of the wood.

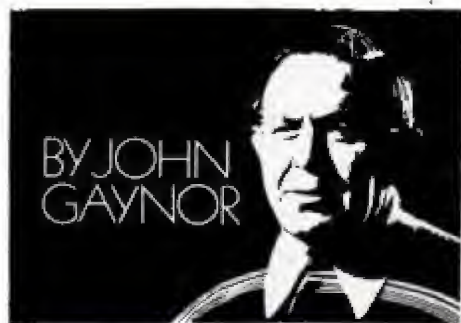
When there is sunshine following rain, the warmth draws the moisture to the surface and from the wood. The painted surface is flaked off in the process. The fact that you also have rotting wood indicates that pressure-treated wood wasn't used.

Replace all rotted wood with pressure-treated, dry wood. Check your decking supports (joist and girders), too. If they have rotted, I'm afraid you'll have to tear down and start over, using dry, pressure-treated wood.

There are several brands available. Check with your local lumberyard or home center to learn what they carry.

[Ed. Note: John's article on where, when and why to use pressure-treated wood will be in the *PM Garden Guide* next month.] **PM**

Do you have a home maintenance or repair problem? Send it to Homeowners' Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of wide interest will be discussed in this column. For more home repair and maintenance help, get PM's Home Care Guide, \$4.95 postpaid. Send order(s) to PM, Dept. HCG, Box 1014, New York, N.Y. 10019.



Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

Source comparative 'tar' and nicotine figures: FTC Report May 1978. Of All
Brands Sold: Lowest tar: 0.5 mg. 'tar,' 0.05 mg. nicotine av. per cigarette.
Golden Lights: 8 mg. 'tar,' 0.7 mg. nicotine av. per cigarette by FTC Method.

Golden LightsTM taste astonishes first-time users.



Unbelievable taste from a low tar surprises smokers.
Many switch to Golden Lights after trying just one pack.



17
MG. TAR
1.0 MG. NIC.



20
MG. TAR
1.3 MG. NIC.



16
MG. TAR
1.1 MG. NIC.



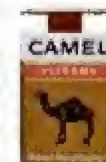
17
MG. TAR
1.4 MG. NIC.



17
MG. TAR
1.2 MG. NIC.



16
MG. TAR
1.1 MG. NIC.



19
MG. TAR
1.3 MG. NIC.



8
MG. TAR
0.7 MG. NIC.

Golden Lights.
The taste high tar smokers
want in a low tar.
(Regular & Menthol.)

THE GUTS AND BOLTS OF A TOUGH CHEVY BLAZER.

A 4-wheel-drive Blazer is guts-and-bolts tough and practical. On or off the road, it's a people mover, trailer tower, cargo hauler. And it has the new 1980 Chevrolet Three-Year Perforation-From-Corrosion Limited Warranty. See your Chevrolet dealer for details. Ask about leasing, too.

1979	1978	1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861	1860	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840	1839	1838	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825	1824	1823	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813	1812	1811	1810	1809	1808	1807	1806	1805	1804	1803	1802	1801	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791	1790	1789	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776	1775	1774	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764	1763	1762	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752	1751	1750	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740	1739	1738	1737	1736	1735	1734	1733	1732	1731	1730	1729	1728	1727	1726	1725	1724	1723	1722	1721	1720	1719	1718	1717	1716	1715	1714	1713	1712	1711	1710	1709	1708	1707	1706	1705	1704	1703	1702	1701	1700	1699	1698	1697	1696	1695	1694	1693	1692	1691	1690	1689	1688	1687	1686	1685	1684	1683	1682	1681	1680	1679	1678	1677	1676	1675	1674	1673	1672	1671	1670	1669	1668	1667	1666	1665	1664	1663	1662	1661	1660	1659	1658	1657	1656	1655	1654	1653	1652	1651	1650	1649	1648	1647	1646	1645	1644	1643	1642	1641	1640	1639	1638	1637	1636	1635	1634	1633	1632	1631	1630	1629	1628	1627	1626	1625	1624	1623	1622	1621	1620	1619	1618	1617	1616	1615	1614	1613	1612	1611	1610	1609	1608	1607	1606	1605	1604	1603	1602	1601	1600	1599	1598	1597	1596	1595	1594	1593	1592	1591	1590	1589	1588	1587	1586	1585	1584	1583	1582	1581	1580	1579	1578	1577	1576	1575	1574	1573	1572	1571	1570	1569	1568	1567	1566	1565	1564	1563	1562	1561	1560	1559	1558	1557	1556	1555	1554	1553	1552	1551	1550	1549	1548	1547	1546	1545	1544	1543	1542	1541	1540	1539	1538	1537	1536	1535	1534	1533	1532	1531	1530	1529	1528	1527	1526	1525	1524	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1512	1511	1510	1509	1508	1507	1506	1505	1504	1503	1502	1501	1500	1499	1498	1497	1496	1495	1494	1493	1492	1491	1490	1489	1488	1487	1486	1485	1484	1483	1482	1481	1480	1479	1478	1477	1476	1475	1474	1473	1472	1471	1470	1469	1468	1467	1466	1465	1464	1463	1462	1461	1460	1459	1458	1457	1456	1455	1454	1453	1452	1451	1450	1449	1448	1447	1446	1445	1444	1443	1442	1441	1440	1439	1438	1437	1436	1435	1434	1433	1432	1431	1430	1429	1428	1427	1426	1425	1424	1423	1422	1421	1420	1419	1418	1417	1416	1415	1414	1413	1412	1411	1410	1409	1408	1407	1406	1405	1404	1403	1402	1401	1400	1399	1398	1397	1396	1395	1394	1393	1392	1391	1390	1389	1388	1387	1386	1385	1384	1383	1382	1381	1380	1379	1378	1377	1376	1375	1374	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1363	1362	1361	1360	1359	1358	1357	1356	1355	1354	1353	1352	1351	1350	1349	1348	1347	1346	1345	1344	1343	1342	1341	1340	1339	1338	1337	1336	1335	1334	1333	1332	1331	1330	1329	1328	1327	1326	1325	1324	1323	1322	1321	1320	1319	1318	1317	1316	1315	1314	1313	1312	1311	1310	1309	1308	1307	1306	1305	1304	1303	1302	1301	1300	1299	1298	1297	1296	1295	1294	1293	1292	1291	1290	1289	1288	1287	1286	1285	1284	1283	1282	1281	1280	1279	1278	1277	1276	1275	1274	1273	1272	1271	1270	1269	1268	1267	1266	1265	1264	1263	1262	1261	1260	1259	1258	1257	1256	1255	1254	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201	1200	1199	1198	1197	1196	1195	1194	1193	1192	1191	1190	1189	1188	1187	1186	1185	1184	1183	1182	1181	1180	1179	1178	1177	1176	1175	1174	1173	1172	1171	1170	1169	1168	1167	1166	1165	1164	1163	1162	1161	1160	1159	1158	1157	1156	1155	1154	1153	1152	1151	1150	1149	1148	1147	1146	1145	1144	1143	1142	1141	1140	1139	1138	1137	1136	1135	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028	1027	1026	1025	1024	1023	1022	1021	1020	1019	1018	1017	1016	1015	1014	1013	1012	1011	1010	1009	1008	1007	1006	1005	1004	1003	1002	1001	1000	999	998	997	996	995	994	993	992	991	990	989	988	987	986	985	984	983	982	981	980	979	978	977	976	975	974	973	972	971	970	969	968	967	966	965	964	963	962	961	960	959	958	957	956	955	954	953	952	951	950	949	948	947	946	945	944	943	942	941	940	939	938	937	936	935	934	933	932	931	930	929	928	927	926	925	924	923	922	921	920	919	918	917	916	915	914	913	912	911	910	909	908	907	906	905	904	903	902	901	900	899	898	897	896	895	894	893	892	891	890	889	888	887	886	885	884	883	882	881	880	879	878	877	876	875	874	873	872	871	870	869	868	867	866	865	864	863	862	861	860	859	858	857	856	855	854	853	852	851	850	849	848	847	846	845	844	843	842	841	840	839	838	837	836	835	834	833	832	831	830	829	828	827	826	825	824	823	822	821	820	819	818	817	816	815	814	813	812	811	810	809	808	807	806	805	804	803	802	801	800	799	798	797	796	795	794	793	792	791	790	789	788	787	786	785	784	783	782	781	780	779	778	777	776	775	774	773	772	771	770	769	768	767	766	765	764	763	762	761	760	759	758	757	756	755	754	753	752	751	750	749	748	747	746	745	744	743	742	741	740	739	738	737	736	735	734	733	732	731	730	729	728	727	726	725	724	723	722	721	720	719	718	717	716	715	714	713	712	711	710	709	708	707	706	705	704	703	702	701	700	699	698	697	696	695	694	693	692	691	690	689	688	687	686	685	684	683	682	681	680	679	678	677	676	675	674	673	672	671	670	669	668	667	666	665	664	663	662	661	660	659	658	657	656	655	654	653	652	651	650	649	648	647	646	645	644	643	642	641	640	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608	607	606	605	604	603	602	601	600	599	598	597	596	595	594	593	592	591	590	589	588	587	586	585	584	583	582	581	580	579
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

SCIENCE WORLDWIDE

A sweeping of space dust

The dust particles in the photos at right may have been shed by a passing comet. And university scientists who analyzed the particles say they may contain new evidence concerning the formation of the solar system.

The particles (about 1/2500-inch in diameter) were collected on sticky plates carried by a NASA-operated U-2 aircraft and deployed at altitudes above terrestrial pollution. Scientists at California Institute of Technology and the University of Washington found several exotic extraterrestrial substances.

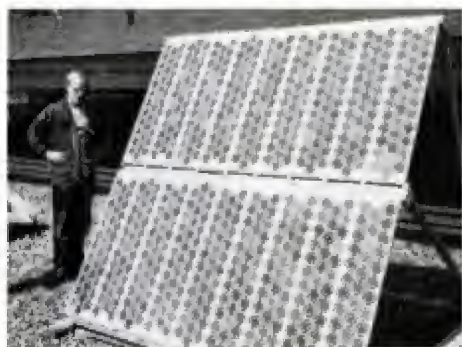
Some are fluffy clumps of different minerals. Others comprise crystals of a single mineral, and a few are hard spheres, apparently formed by melting in the atmosphere or outer space. Most interesting of all to the scientists, some particles appear to contain slight chemical irregularities. Researchers are currently looking for more of the unusual features, evidence of nuclear reactions that occurred when the solar system was formed. If they find them, scientists will know that at least some of the dust has been cluttering the attic of space above us for the past 4.5 billion years.

The "comet dust" research comes at a time when NASA is planning a major mission to send an unmanned spacecraft to meet Halley's Comet when it next appears, in late 1985.

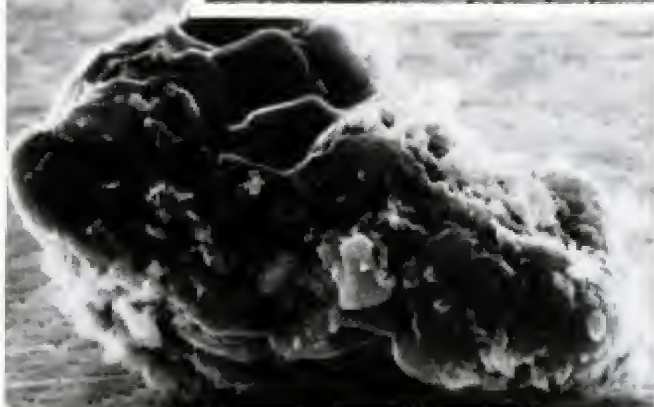
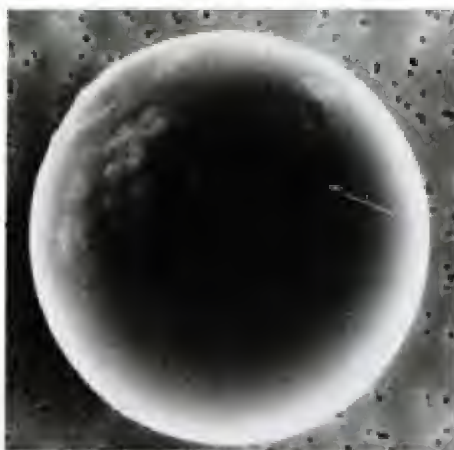
Sun power at Winter Olympics

The rack of solar cells in the photo below may power communications for part of the Winter Olympics this month in Lake Placid, N.Y.

With the flick of a switch, the pho-



Panels may power communication lines.



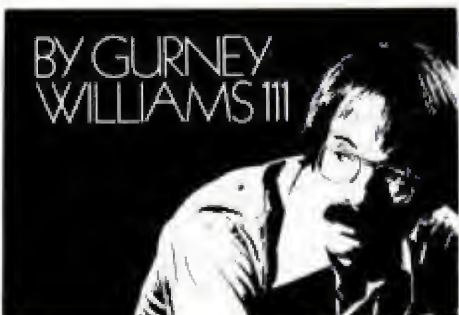
Tiny, hard sphere (top) was formed by melting in Earth's atmosphere or outer space. A second kind of space-dust particle (above) is crystal core flecked with debris.

tovoltaic cells can be hooked into the communications system connecting a command post with remote stations on the 4867-foot-high Whiteface Mountain.

The 20 panels, made by ARCO Solar Inc. of California, are most likely to be called into use during the giant slalom events on the mountain. During other events, the system will be available as a backup, in case the conventional power is interrupted. Each of the 20 panels can produce up to 20 watts. Power is fed to a battery system which could keep the system running for days if it's cloudy.

The solar installation is one of a number of advanced technological

(Please turn to page 44)



BY GURNEY WILLIAMS III



The pride of your toolchest...

Offset Leverage Nipper

Throw away your old nipper. Offset jaws greatly increase draw capability on brads, tacks, finishing nails, etc. Especially good for working in tight corners. You bite, hold and draw with less force. Green lacquered handles lay comfortably in your hand. Made in Germany. Jaw width 1/2". Overall length: 7".

Offset Leverage Nipper \$12.95

☐ Enclosed is \$12.95 plus \$1.50 Shipping/Insurance for Offset Leverage Nipper. Include NEW catalog FREE.

VISA or MC. order toll free 1-800-343-6130

Name _____

Address _____

City _____ State _____ Zip _____

☐ Enclosed find \$1.00 for NEW 79-80 Catalog only

THE PRINCETON COMPANY

P.O. Box 276-39, Princeton, MA. 01541

WE DARE YOU TO COMPARE!

WESTWOOD OFFERS YOU MORE...

SAVE 20-50% OVER COMPARABLE FINISHED CLOCKS



YOUR SELECTION OF:

CLOCKS
17 MODELS TO CHOOSE FROM
MOVEMENTS
20 DIFFERENT MOVEMENTS AND DIALS
OPTIONS
BEVELED GLASS HANDCRAFTING
OAK OR CHERRY SOLIDS RARE BURLS
EASY TO ASSEMBLE
PRE-CUT KITS
ONLY THE FINEST QUALITY
NEW FREE
COLOR CATALOG

WESTWOOD CLOCKS N. KITS

Uncompromised in quality
Dept. 004F
3210 Airport Way
Long Beach, Ca 90806
(213) 595-4981

CONSERVE ENERGY



Electrify your Bike...

PEDALPOWER-Exciting new powerful electric drive for bikes. Tames tough hills. Be independent. Shop when you want. Fits all bikes and adult trikes. Easy to use and install. Beat high gas prices. Recharges overnight at home. Travel 100 miles for a dime.

Get your exercise without strain. Pedal easily with motor engaged to help improve your health. Visit friends. Travel to work or ride for fun. Starts without pedaling. Noiseless, non-polluting. Virtually maintenance-free operation!

Thousands in use today by senior citizens, students, housewives, workers, handicapped and professionals. Call today or write for free booklet with complete details on PEDALPOWER motors, Take-Apart Electric Bikes and Adult Electric Tricycles.

Call Toll Free
800-257-7955*

For this **FREE BOOKLET**
& Special Offer or Write:

PEDALPOWER

General Engines Co.
5636 Mantua Blvd.
Sewell, NJ 08080



* In AK, HI, NJ call collect (609) 458-0270

YOU DON'T NEED CASTRO'S PERMISSION TO ENJOY THE UNIQUE HAVANA FLAVOR.

If you remember savoring and lingering over a fantastically mild and flavorful Cuban leaf cigar in the days before the Cuban embargo, you will be interested in this offer — and the story behind it!

When the Cuban embargo hit, we and other small manufacturers of fine custom-made cigars faced ruin. Our very existence depended on maintaining the same incomparable quality we had staked our reputation on.

The solution was pure cloak-and-dagger. One dark night a few years ago a group of daring Cuban expatriates put to sea carrying a precious cargo of Cuban tobacco seeds. After running a gauntlet of Cuban gunboats they finally reached their destination —

Honduras. Here under almost identical conditions of climate and soil, this prime tobacco flourishes to this day, far from its native land. This is the tobacco we use to make our superbly mild and flavorful cigars — cigars an expert can't tell from Havana.

MY OFFER TO CIGAR LOVERS

I will send you postpaid a variety of 60 factory fresh cigars. Smoke one or a half-dozen with my compliments. If these cigars aren't all you expect and a great deal more, return the remainder by parcel post within 30 days and I'll refund your money. No questions asked. Your delivered cost is only \$10.90 for 60 Factory-Fresh Cuban Seed Leaf Cigars.

A384 To order, fill in and mail coupon to

THOMPSON CIGAR CO.

200 N. Edison Ave., Dept. A384, Box 1839, Tampa, FL 33601

O.K., TOM! Ship me the Victory Sampler under my money-back guarantee for only \$10.90.

- ☐ Check for \$10.90 enclosed. (Fla. residents add 4% sales tax.)
☐ Charge \$10.90 to my
☐ Visa ☐ Master Charge
☐ American Express
☐ Diners Club
(OFFER GOOD IN U.S. ONLY)

Credit Card No. (Print all digits)

Master Charge Also Enter
4 Digits Below Your Acct. No.

EXP. DATE

name

street

city

state

zip

CREDIT CARD HOLDERS USE

TOLL-FREE 800-237-2559

44 POPULAR MECHANICS

SCIENCE WORLDWIDE

(Continued from page 43)

systems to be used at the games. (See *The Jump: Anatomy of the Top Olympic Spectacle*, page 91.)

Nature's own oil spill

Dr. George Harvey, a federal research oceanographer, smelled oil in a sample of Atlantic Ocean water collected from 600 feet below the surface. "Damn it," he said. "Someone's contaminated the sample with lube oil."

But when Harvey repeated the collection, traces of oil were still there. He continued to find oily water below the surface as his research vessel completed a month-long cruise. His conclusion: The continental shelf of Venezuela or Trinidad had leaked up to 30 million tons of toxic oil into the sea, a monstrous spill 800 nautical miles long, 300 feet thick and up to 30 miles wide. Previous estimates of annual oil leakage into the sea were only five or six million tons from all sources.

Harvey's work seems likely to intensify debates between petroleum companies and environmentalists. "Companies can argue their operations contribute only a small fraction of oil in water," Harvey told us. "Environmentalists can say there's more oil in the sea than we knew, so even small additional spills are highly dangerous."

Radiation pill: a follow-up

A New Jersey drug firm plans to be first to market potassium iodide, which counters the effects of some radiation on the thyroid gland.

But the company, Wallace Laboratories of Cranbury, N.J., has no immediate plans to sell the pills or drops to the general public. A spokesman said initial marketing efforts would be directed toward cities, states and utilities that owned nuclear powerplants. The potassium iodide might be available to the general public, over the counter, at some point in the future, the spokesman said. Its price hasn't been set.

A spokesman for the Food and Drug Administration said Wallace's application to sell the anti-radiation drug would be approved as soon as the federal agency received a copy of the drug-container label.

As we reported here last July, the FDA is on record as encouraging applications to sell potassium iodide as protection against radioactive iodine 131. "As soon as we get that label, you'll see a turn-around time [for approving and application] so fast it'll make your head spin," an FDA spokesman told us. **PM**

CANADA AT ITS BEST

Light. Smooth. Imported Canadian Mist®
The whisky that's becoming America's favorite Canadian.



Share some tonight.

IMPORTED BY B-F SPIRITS LTD., N.Y. N.Y. CANADIAN WHISKY—A BLEND, 80 PROOF © 1979

Photographed at Bow Lake, Province of Alberta, Canada.

THREE WAYS TO PASS A GAS PUMP.

You're looking at three of the most economical ways of getting from here to there on two less wheels than you're probably using now.

The Yamaha XS400 Special II. Mid-size and manageable and surprisingly quick, it'll also squeeze 64 miles from a gallon of gas.

The sporty XS650 Special II lives up to its British heritage by sipping petrol at a most conservative rate. It'll make a gallon go 58 miles.

With one big cylinder, the SR500 produces incredible power and torque. And also incredible mileage: over 60 miles to the gallon.

REGULAR	1.05
NO-LEAD	1.09
PREMIUM	1.10

CLOSED
SATURDAYS, SUNDAYS,
And HOLIDAYS

Those little signs outside the Exxons, Shells and Texacos of the world are trying to tell you something.

They're telling you to get a Yamaha.

YAMAHA

When you know how they're built.

XS400 Special II



XS650 Special II



SR500



Mileage figures based on EPA testing for city riding. Your mileage may vary depending on the way you ride. Although not shown, one or two rear view mirrors are standard equipment. Always wear a helmet and eye protection.

PM WORKBENCH

PM EXAMINES PRODUCTS AND SERVICES

Old standby gets a facelift

Edmund Scientific, 7082 Edscorp Building, Barrington, N.J. 08007, has modernized the format of its world-famous catalog. The newly designed catalog—which presents more than 4000 products—contains 100 pages, with 50 of them printed in full color.

You will probably be surprised, as I was, to find that the catalog is no longer digest size, but now measures 9 $\frac{3}{4}$ ×8 $\frac{1}{4}$ in. Though some in our office expressed a sentimental preference for the old format, I think the move from small to big in this case is a change for the better.

The 1979 catalog can be obtained at no charge by writing to Edmund at the address above.—H.W.

New drills from Millers Falls

The Millers Falls Div. of Ingersoll Rand, 253 East Washington Ave., Washington, N.J. 07882, has unveiled seven new drills that are labeled "Super Duty." Though I haven't yet tested one of the drills, I plan to do so soon.

The seven models of drills include: three $\frac{1}{4}$ -in. drills with 1900 rpm, 0-1900 variable speed and reversing and 0-4000 rpm variable speed; three 3.8-in. drills with 600-rpm, 1000-rpm and 0-1000-rpm variable speed and reversing; and one $\frac{1}{2}$ -in. drill with 0-600-rpm variable speed and reversing.

All seven models include all ball



Tough drill comes with 10-ft., heavy-duty cord, and it is UL- and CSA-approved.

bearing/needle bearing construction, heavy-duty chucks, double insulation and a 10-ft. rubber cord. The drills are double insulated and require no grounding.—H.W.

Ratchet chain wrench

Though the 360° ratchet chain wrench is truly a tool for the profes-

sional, it is also one that many homeowners who do their own piping work might want to know more about.

The ratchet chain wrench will grip both steel and plastic securely—yet it won't gouge the plastic. Since there are no jaws on this tool, it's great for working in close quarters.



Ratchet chain wrench has serrated teeth on one side of chain (arrow) to grip large nuts and pipes without crushing them.



To use, wrap chain around pipe, feed end of chain under anchor pin (A), and hook to notch on spring-loaded pressure clip (B). Use like any ratchet-operated wrench.

The wrench sells for \$49 postpaid, and is available from Nicholson Distributing, 1324 Kingston Dr., Ogden, Utah 84403.—J.P.

Big-hole woodbits

Many serious woodworkers prefer a bit with a center spur because greater drilling accuracy is assured. Now Leichtung Inc., 4944 Commerce Parkway, Cleveland, Ohio 44128, is offering four large-diameter versions. I've used all four— $\frac{3}{8}$, $\frac{1}{2}$, $\frac{7}{8}$ and 1 in.—and can report that they've earned a permanent place in my drill-accessory box.

The bits are priced at \$10.95, \$12.50, and \$13.95 and \$15.50 respectively, or \$39.95 for all four, plus \$1.75 postage.

They're good for use in either



Big hole bits feature step-down shanks, can be used in $\frac{1}{4}$ -in. portable drill.

drill press or portable drill with $\frac{3}{8}$ -in. or greater chuck capacity.—H.W.

Twist ties at your fingertips

Here's a handy product for both workshop and kitchen—a refillable, wall-mounted container that dispenses nonrusting, refillable ties for plastic bags and the like. In the shop, mine comes in handy for holding nails, screws and small tools. I've even used ties to hold small parts when gluing. My wife uses one (mounted in the pantry) for tying



To install refill (left), cover is removed and reel is inserted (above). The spring-steel piece at bottom is used to sever the tie at desired length.

of food-storage and garbage bags.

Dispenser is \$2.29, refills \$1.59, at general merchandise stores such as K-Mart. Weld Tron, 1532 South Washington Ave., Piscataway, N.J. 08854, makes it.—H.W.

If you've come across a new product with some special features, let us know about it. Write to PM Workbench, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019.



We wouldn't trust this job to anything but a Crescent.

If I strip these nuts, it'll probably cost more for the plumber to fix what I did, than to fix what went wrong.

That's why we won't trust this job to anything but a Crescent adjustable wrench and Crescent adjustable pliers.

My Crescent wrench adjusts to snug down tight on any size nut or bolt, so there's less chance for slipping.

And my Crescent pliers have "locking grooves" so I can adjust them for small, medium, or large size pipes or connections.

But be careful. Not every adjustable wrench or pliers is a Crescent. You'll find

Crescent products where they keep all the quality tools from Cooper the Toolmaker: the Cooper Tool Center in your local store.

Look for Cooper next time you need tools you can depend on.



Boker • Crescent • Lufkin • Nicholson • Weller • Wiss • Xcelite
Friends you can trust...from Cooper the Toolmaker.



PM's Whatsit

A comely former secretary, now a design student, Stella Wain-Heapy hails from Goring-on-Thames, England. As if that were not enough, she's gone and invented some sort of jacket to fit on a jug. Why on earth would Ms. Wain-Heapy invest time that could well be spent in a disco to go and do something like that? Can't imagine? Turn the page.

The census — this one counts

The 1980 census is nearly upon us. On or about March 28, every household in the United States will receive the government's 20th Decennial Census of Population form in the mail. If you don't fill out the questionnaire and return it, you'll be visited by a census-taker.

It makes sense to cooperate. Federally funded programs in your area may depend upon updated 1980 figures on, say, farm population or income levels. Also, for every 1 percent of the population who do not fill out their questionnaires, follow-up costs — borne by all taxpayers — will amount to about \$2 million. Finally, the maximum penalty for refusing to cooperate with the Bureau of the Census is a fine of \$5,000.

Some people hesitate to fill out census questionnaires because they worry about how the information may be used. Federal laws covering the confidentiality of census information are quite specific and rigid, extending to all other government agencies. The FBI, for instance, or the IRS, cannot legally avail themselves of any data acquired through the census-taking process. Since the confidentiality provision was introduced, in 1870, no Census Bureau employee has ever been formally charged with divulging confidential information. Even the Bureau's computers are programmed to identify and refrain from printing out figures that might identify specific businesses or individuals.

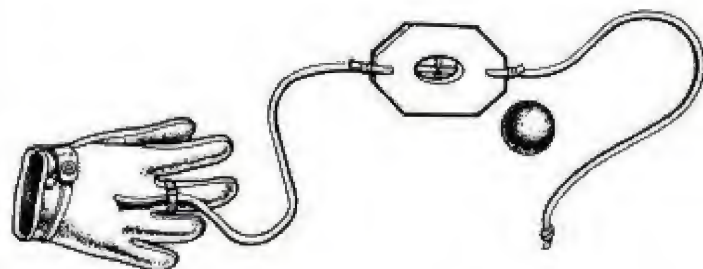
Census data on individuals remains confidential for 72 years. People constructing family genealogies often make use of declassified data available from the Census Bureau after that period has elapsed.

The questions for 1980 will consist basically of the same ones regarding names, ages and marital status of householders. Some "extras" will be thrown in regarding energy usage and work—primarily commuting — patterns.

Also the final solution to the Philistine problem



John R. Polly, a retired painting contractor from Oxnard, Calif., is 51. Tim, a German shorthair, is 10. There is nothing that Tim likes better than for John to walk along the beach with him and chuck old tennis balls for him to fetch. John likes it, too, except



that whenever there was a touch of stiffness in the old shoulder the tennis ball never went far enough to give Tim a good run.

John eventually developed a solution, and it works so well he had it patented. It's a sling arrangement with a leather pocket that holds the tennis ball securely and an ingenious attachment of one sling strap to a finger on a glove worn by the slinger. This assures smooth, powerful releases when the other end — held between thumb and finger — is let go.

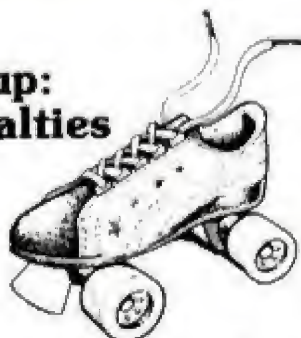
John's record tennis ball heave to date is about 225 feet. Tim has never been in better shape.



Whatsit revealed

With a little flexible foam, a 100-watt heating element and a vinyl cover with a Velcro fastening, our Stella has gone and invented the answer to a home winemaker's prayer. The electrically heated jacket keeps wine-to-be at exactly the right temperature for fermentation, even though ambient temperature may vary right down to freezing. It's designed to fit a standard jug sold to grape fanciers in Britain.

PM follow-up: Skate casualties roll on



When PM talked about the technology behind the roller skating boom eight months ago (*The Roller Renaissance*) (page 94, June '79), injuries resulting from skating accidents were already shaping up as a statistical caution to the sport's newcomers. There is no question that contemporary urethane-wheeled skates are the safest ever made, but the sport is drawing great numbers of inexperienced persons. The seemingly forgiving nature of the soft plastic wheels and precision suspensions apparently combines with an aura of exhibitionism to produce a high risk potential. Skaters are trying things they can't do in places they shouldn't be trying anything — on streets, sidewalks and in shopping malls.

According to the Consumer Products Safety Commission, wrists, knees and elbows account for the overwhelming majority of skaters' injuries. Over 100,000 emergency room treatments for skating accidents were logged in 1979 — more than double the annual rate of five years ago.

Interestingly, about one-fourth of those injured and admitted for treatment are 25 years old or older. Many of them apparently thought the new soft-wheeled skates would let them "perform" safely on irregular surfaces. Not so. The crack in the sidewalk is still waiting to do you in, if you're not careful, and unless you've still got your baby teeth, the resulting repairs will keep your dentist in golf clubs for a long time.



Oscar Pumpin picks over the bumper crop . . .



. . . and takes torch in hand to create . . .



. . . a magnificent wall-mounted stallion.

Oh, give me a chrome

The editors at PM have seen their share of sculpture done from automobile parts — and very little, frankly, we'd care to have in the house. But sculptor Oscar Pumpin, who currently haunts the junkyards of Long Island, N.Y., has got something going for him. Oscar works only with chrome — primarily bumpers. Oscar's tours-de-force are his chrome animals, often nearly life-size, in which he does a brisk business at art fairs in the Long Island area. But lest you think there's no message in a Pumpin work, be advised that the handsome horse shown here was deliberately fashioned (most of it) from a '71 Mustang. Far out.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

The Vantage Point

Where great taste and low tar meet



FILTER 100's: 10 mg. "tar", 0.8 mg.
nicotine, FILTER, MENTHOL:
11 mg. "tar", 0.8 mg. nicotine, av. per
cigarette, FTC Report MAY '78.

A lot of car for a lot of reasons.



The Body by Fisher reason.

Life can be a lot tougher on a car than you might think. That's why Chevy Chevette's built solid. With a unitized Body by Fisher that's been welded to be rigid and structurally tight. With double-panel doors, hood and deck lid construction. And with extensive anti-corrosion treatments to help fight rust.

Let there be no mistake about it. Chevette's built to take some of life's hard knocks.

The convenient service reason.

Dallas to Duluth... Cincinnati to Seattle... coast to coast. That's where you'll find neighborhood Chevy dealerships. And the kind of dedicated dealers and technicians who can provide you with the kind of service and maintenance you might need.

Who says good help is hard to find? No matter where you are in the U.S.A., you won't have to go far to find Chevrolet.

The lower price reason.

The 1980 Chevy Chevette 4-Door Hatchback is:

\$340 less than
'80 Toyota Corolla Deluxe 4-Door
\$321 less than
'80 Datsun 210 Deluxe 4-Door
\$1,232 less than
'80 VW Rabbit Custom 4-Door

Based on Manufacturers' Suggested Retail Prices. Tax, license and available equipment additional. Destination charges will vary by location and will affect the comparisons. Level of standard equipment will vary.

The standard reasons.

Of course, then there are all those standard features for which Chevette has become so famous:

- White-stripe glass belted radial ply tires • Wheel trim rings • Bumper rub strips
 - Body side moldings • AM radio • 4-speed manual transmission • Reclining bucket seats • Cut-pile carpeting
 - Even more. (Many features are not standard on our lower priced Chevette Scooter.)
- See your Chevy dealer about buying or leasing a 1980 Chevy Chevette.

1980 Chevy Chevette

A lot of car for the money.



THE PM GARAGE

CAPSULE REPORTS ON NEW AUTO PRODUCTS

Simple chain installer

Installing snow chains used to be a hassle for me until I discovered Sno-Bloc. Sno-Bloc is a yellow ramp made of tough polycarbonate plastic. It's 9½ inches wide by 21½ inches long, weighs just 2½ pounds and is divided into four sections. The first section raises the car's wheel 2 inches off the ground. The middle two sections are level. The last section acts as a brake so that you can tell when your tire is correctly positioned on the ramp.

To use Sno-Bloc, the chain is placed with its crosswise links in the ramp's indentations (which are between the four main sections). The car is then driven forward so that the wheel rests squarely on Sno-Bloc's middle sections. The chain can then be fastened easily because the indentations allow it to move slightly.

Each Sno-Bloc is so strong it can support 2000 pounds. Thus, they can be used on any vehicle that weighs less than 8000 pounds. It costs \$12.95 postpaid from Sno-Bloc Inc., 17981 G Sky Park Circle, Irvine, Calif. 92741.—*Moss Miller*



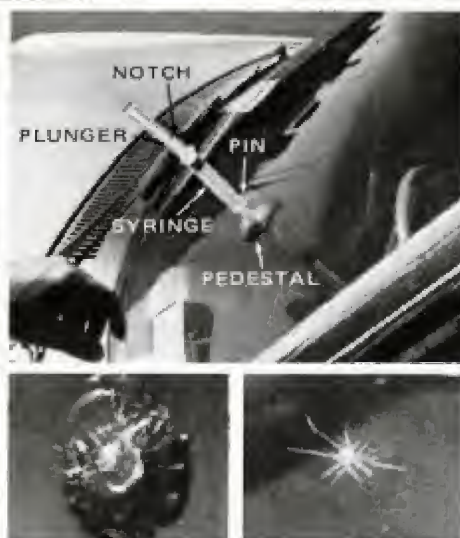
Links of chain are placed in Sno-Bloc's indentations; then you simply drive up.

Windshield repair kit

To passersby, Tony Jacino appears to have lost his senses. There he stands, next to his 1968 Buick LeSabre in a Howard Johnson's Restaurant parking lot, calmly making cracks in the car's windshield with a metal ball.

But Tony isn't crazy. He's making the cracks on purpose to demonstrate to me how his new resin repair kit can fix a small "bull's-eye" crack in the Buick's laminated windshield.

First, he applies a special pedestal to the crack—it has a hole in its center so the resin can get to the glass.



Top: When plunger is up, vacuum draws air out of solution in pedestal. Above left: "bull's-eye" crack before repair. Above right: After, it's resin-filled, hard to see.

The pedestal is mounted on an adhesive base.

He then attaches a large syringe to the pedestal (it comes without the needle). Two premeasured solutions, which come in their own small syringes, are squirted into the large syringe.

A plunger is then placed in the big syringe. A pin is removed so that the plunger can be pressed down very easily.

Next, the pin is replaced and the plunger is drawn up, creating a vacuum which draws most of the air out of the solution. After 10 minutes, the plunger is depressed until a notch is engaged that holds it firmly in place. This forces the epoxy solution into the crack under pressure.

After four hours at 50° to 70° F., the entire apparatus is removed and discarded. The repair, while not perfect, is certainly a big improvement. All that remains visible is the tiny point of impact, and glare is greatly reduced.

Unfortunately, the kit cannot repair cracks that have "spread." But Tony informs me he is working on this.

The kit can be ordered from Clear Star Products, Box 737, East Moriches, N.Y. 11940. It's \$13.95, plus \$2 for postage and handling.—*Moss Miller*

Handy quartz-halogen light

Whenever I turn to my 6-volt, battery-powered lantern to illuminate something at night, it always seems

that the batteries have become weak or gone dead. Recently, though, I tested a compact (3½×6¼×4-inch) quartz-halogen spotlight made by Ushio Electric of Tokyo.

Dubbed Handy Light, the unit plugs into my car's cigaret-lighter socket, thus assuring a reliable source of power. Its light output is 90,000 candlepower, more than most regular headlights will put out on high beam.

Handy Light has a 12-foot cord and a built-in handle for easy use. It is available for \$14.95 postpaid from Ushio America, 140 East Savarona

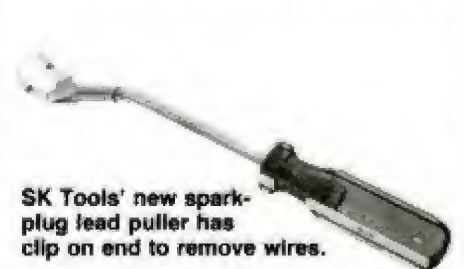


Ushio's Handy Light plugs into cigar lighter, has wallop of full-sized headlight.

Way, Carson, Calif. 90746.—*Moss Miller*

Sparkplug lead puller

SK Tools' new sparkplug lead puller has a handle like a screwdriver's and a metal shaft with a special clip at the end. The shaft is bent at an



angle. Since there are no handles to squeeze together, as on a conventional plier-type lead puller, the SK puller can remove leads that are in very inaccessible places while preventing painful burned or bruised knuckles.

The SK lead puller is manufactured by Dresser Industries Inc., 3201 North Wolf Rd., Franklin Park, Ill. 60131. It is available at most auto-parts and hardware stores for \$4.49. Ask for SK part No. 73601.—*Moss Miller*

75 MPG!

**TOP SPEED OF 90 MPH!
1,125 MILES OF DRIVING
(from a 15-gallon fuel tank)!**

That's the kind of high-mileage, fuel-pinching performance you can get — right now — with the amazing **HYBRID ELECTRIC CAR!** What's more . . . *you can build it yourself!*

HOW IT WORKS

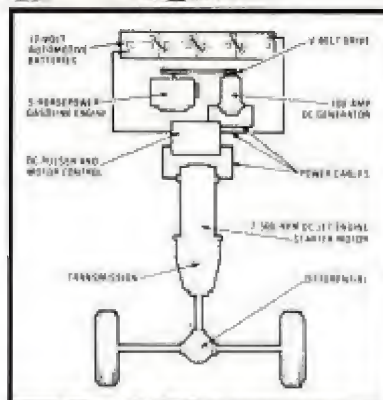
All you do is take your existing car (or buy a used body) and replace its original power plant with a small gas-powered lawn mower engine. (That's right, a lawn mower engine!) This engine drives a generator which, in turn, supplies the vehicle's drive motor with electricity allowing you to travel at speeds up to 50 MPH.

When more power is needed, four automobile batteries — hooked up in series and fed by a 100-amp generator — give you plenty of kick for passing, climbing hills, and for running at higher speeds (up to 90 MPH) . . . and to help save normally wasted energy, a regenerative braking circuit automatically converts the drive motor into a generator that feeds and charges the batteries *while the vehicle is decelerating!*

Your total cost — by buying your own parts and building it yourself — is under \$1500. Your first year's benefits alone — in fuel savings *and* in hassle-free driving — will more than pay for the car!

GET ON YOUR WAY TO HIGH-MILEAGE MOTORING . . . NOW!

THE MOTHER EARTH NEWS® — the national magazine long recognized as a leader in alternative energy — offers you a detailed, step-by-step set of plans for making the **HYBRID ELECTRIC CAR.** The complete package includes the plans, bill of materials, and list of suppliers. The plans sell for \$15.00 and come with a no-risk guarantee. To order simply fill in the coupon below and mail it — along with your payment — to: **MOTHER'S PLANS, Dept MP, P.O. Box A, East Flat Rock, North Carolina 28726.**



The layout of the new drive system.

Enclosed is \$15.00. Please send me the **HYBRID ELECTRIC CAR** plans. I understand that I have 10 days to examine the plans, and if I decide not to use them, I can return them for a full refund.

Ship To:

NAME _____ ADDRESS _____
CITY _____ STATE _____ ZIP _____

CHARGE IT TO MY ☐ MASTER CHARGE OR ☐ VISA CARD

NAME _____ ACCOUNT NO. _____ EXPIRATION DATE _____

MASTER CHARGE INTERBANK NO. _____ SIGNATURE _____

Add \$1.00 if you wish to have your plans sent first class.

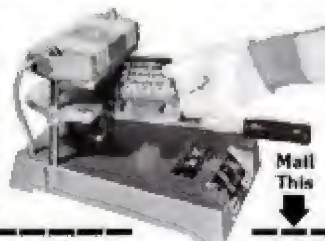
North Carolina residents add 4% sales tax.

MOTHER'S PLANS, DEPT MP, P.O. BOX A, EAST FLAT ROCK, NORTH CAROLINA 28726

NEW RUBBER STAMP BUSINESS PAYS BEGINNERS UP TO \$16.50 AN HR. Start at Home in Spare Time

The multi-billion dollar Rubber Stamp business—once controlled by a few big companies—is now being taken over by small operators—one in every community in the U.S. Men and women who have this inexpensive machine can turn out huge quantities of Rubber Stamps. Working full capacity it can earn as much as \$33.00 an hour for the operator. You don't need experience. We supply everything. And, can show you how you can have this business FREE. Cash in on the lucrative Rubber Stamp business in your community NOW! We'll mail full particulars FREE and no salesman will call. Rush coupon today or send your name on a postcard to:

Rubber Stamp Div. - Dept. R-2-JB
1512 Jarvis Ave. - Chicago, IL 60626



Rubber Stamp Div.

1512 Jarvis Ave., Dept. R-2-JB, Chicago, IL 60626

Please rush full particulars that can get me started in the profitable Rubber Stamp business at home. Include details on how I can get the business FREE! Everything you send is free and no salesman will call.

Name _____

Address _____

City _____

State _____ Zip _____

FREE!

FOR FASTER SERVICE—CALL TOLL FREE
800-621-5809—24 hours a day—7 days a week
In Illinois Call—800-972-5858

HINTS FROM READERS

Rubber-stamp aid



If a rubber stamp fails to make a good impression, try placing a folded cloth or handkerchief beneath paper being stamped. Four to eight thicknesses of cloth make a big difference.—*Tom Clyde*

Dowel marking gauge



You can make a marking gauge for a specific job using a dowel, a 3-in. pulley and a nail. Bore several holes spaced at 1-in. intervals in the dowel. Insert dowel into pulley. Adjust dowel until a hole is in the correct position for the nail to mark the board. Then tighten the setscrew. Scribe as shown.—*Ken Patterson*

Reinforcing chain links



Make the unsoldered links of chain jewelry less likely to come apart by filling the joint with a drop of epoxy or cyanoacrylate adhesive.—*Walter E. Burton*

NOW! Learn to repair video cassette and disc systems with NRI's at-home training in TV and Audio Servicing.

NRI training keeps you up with the state of the art so you're thoroughly trained for professional TV and audio service work. New lessons cover the latest advances in home video tape and video disc units, even laser systems. And they're included at no extra costs as part of your NRI course.

Learn at Home in Your Spare Time

You learn right at home, at your convenience, without quitting your job or going to night school. NRI "bite-size" lessons make learning easier...NRI "hands-on" training gives you practical bench experience as you progress. You not only get theory, you actually build and test electronic circuits, a complete audio system, even a color TV.



Build Color TV with Computer Programming

As part of your training in NRI's Master Course, you assemble and keep NRI's exclusive, designed-for-learning 25" (diagonal) color TV, the only one complete with built-in computer tuning that lets you program an entire evening's entertainment. As you build it, you introduce and correct electronic faults, gain understanding and practical experience.

You also construct a solid-state stereo amplifier and tuner, complete with speakers. You even assemble professional test instruments, so you know what makes them tick, too. You build a transistorized volt-ohm meter... a CMOS digital frequency counter... integrated circuit TV pattern generator... even a solid-state triggered-sweep 5" oscilloscope. You use them in your course, keep them for actual TV and audio servicing work.

Free Catalog... No Salesman Will Call

Send today for the 100-page catalog that shows all the lessons, all the equipment and training material you get. The catalog will show you other NRI opportunity fields like the new course in Microcomputers & Microprocessors, Complete Communications, and more. With the addition of video cassette and disc systems, television has taken on an exciting new dimension. NRI training can put you right in the center of that dimension.

If card has been removed, write to:



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016

CAR CLINIC

SOLUTIONS FOR MECHANICAL HEADACHES BY MORT SCHULTZ



All keyed up

I'm having a difficult time removing the ignition key from my 1974 Chevrolet Monte Carlo. Occasionally, it's also tough getting the engine started without jiggling the key. Can you help me, please?—Sam Nasca, Rochester, N.Y.

Sure, Sam. The key probably has a burr, or two, causing it to catch as you pull it from the lock. The same burr, or two, can keep the key from seating and tripping all tumblers, necessary to complete the circuit for starting.

To knock off any sharp edges, buff the key with a wire brush. Then, shoot powdered graphite into the ignition lock. Work the deburred key back and forth a few times. This entire procedure should solve your problem.

Fire and brimstone

On uphill acceleration, my 1979 Oldsmobile Cutlass Brougham with diesel engine belches black smoke. There is no missing that I can feel, but there is an occasional light knock. Can you give me your opinion as to the cause?—Charles R. LaDow, San Diego, Calif.

Considering the smoke and occasional light knock, my first thought is that an injector is sticking in the open position. However, since the car doesn't act up when driven on level ground, the injector theory may not prove to be true. What's another reason, then, for black smoke?

According to a spokesman at Oldsmobile, if injectors are performing properly and the engine is tuned up correctly, smoke at wide-open throttle may be normal. The amount of smoke a diesel engine creates when it's under load is related to the size of the engine.

Engines that have a smaller displacement (4.3 liter, say, like your Olds) will labor and smoke more at wide-open throttle than engines of larger displacement (for example, the 5.7-liter engine used in the Cadillac Seville). The density of the

smoke can be reduced by easing off the throttle as you go uphill, but then the engine has to negotiate hills under reduced power.

I want to add that Oldsmobile, although aware of the smoking-under-load situation, has not issued service instructions to combat the problem, other than to have injector functioning checked. It makes me believe that the condition has to be tolerated.

One knock after another

I, too, have fought the "ping" or "cackle" problem with my Chrysler Corp. car, just as Mrs. Gladys Porter described in your Oct. '79 column. The noise occurred during light acceleration of my 1978 Chrysler LeBaron (318-cu.-in. engine) with the transmission in high gear. The Chrysler dealer adjusted timing (as you suggested that Mrs. Porter do), re-routed vacuum hoses, considered replacing the spark control computer and so on.

Nothing helped until an assistant service manager referred to a service bulletin which recommended replacing the torque converter lock-up spring in the transmission. Success! The same solution worked for my

brother's 1979 Chrysler Cordoba. I think Mrs. Porter should tell this to her dealer. He must have the same service bulletin.—Jim Mershimer, Gibsonsia, Pa.

The service bulletin Jim refers to is 08-26-78, which discusses a spark knock of short duration on acceleration, just after the torque converter locks up.

The modification calls for you to install a new torque converter spring and/or lock-up valve (the parts called for are dictated by the transmission serial number). The repair raises torque converter lock-up speed sufficiently to keep cylinder pressure from increasing to a point which fuel octane can't handle. If the cylinder pressure rises above this point, gasoline explodes, which causes detonation (spark knock).

The lock-up torque converter acts as a clutch, which engages just after the transmission shifts to high gear. If torque converter speed is too low, the engine labors until torque converter speed increases. This momentary laboring causes cylinder pressure to rise, which can result in detonation.

The modification described in the Chrysler service bulletin prevents laboring by increasing torque converter lock-up speed to about 40 mph. On some cars, application of this service bulletin can get rid of spark knock. However, over the past several years, there have been a number of service bulletins issued by Chrysler to solve the spark knock problem.

The one that I reported in October is the latest advisory. If your Chrysler engine detonates, see that a mechanic consults all service bulletins under service bulletin index head-

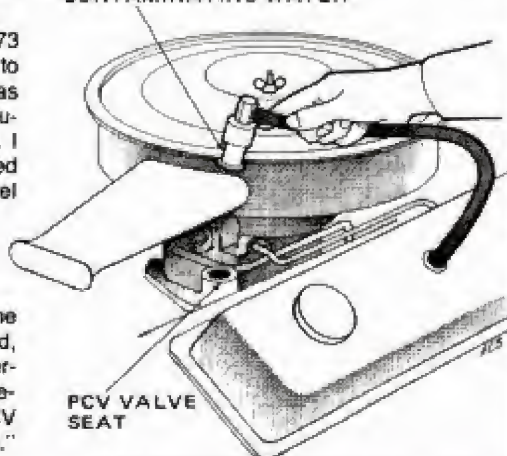
(Please turn to page 60)

Pennies from heaven

Our thanks to reader Paul Pollak (address unknown) for sharing this experience, which shows the importance of remembering a common, but often neglected, part. Paul writes:

"I recently checked the oil level of my 1973 Ford Pinto station wagon and was surprised to find it one inch above the FULL mark. Color was milky-gray. A mechanic told me I had 'big trouble'—that water was contaminating the oil. I decided to change oil and filter, and checked coolant level every day. Again, the oil level rose and color turned. Oddly, the radiator stayed full, discounting the loss-of-water theory. Other mechanics all blamed water contamination, but none could say where the water was coming from. Finally, someone said that maybe my PCV valve was clogged, preventing the crankcase from venting properly and causing moisture to condense and deposit water in the oil. Since I replaced the PCV valve, for pennies, I've had no more trouble."

PCV VALVE:
SOURCE OF OIL-
CONTAMINATING WATER





There's a reason so many sports car enthusiasts who own a truck, own a Toyota SR-5 Sport Truck. It's more than just the presence of a 5-speed transmission, or bucket seats. Call it a feeling, the way everything works together. Because "feel" is what sports cars, and the SR-5, are all about.

You'll know what we mean the moment you start the 2.2 liter engine.

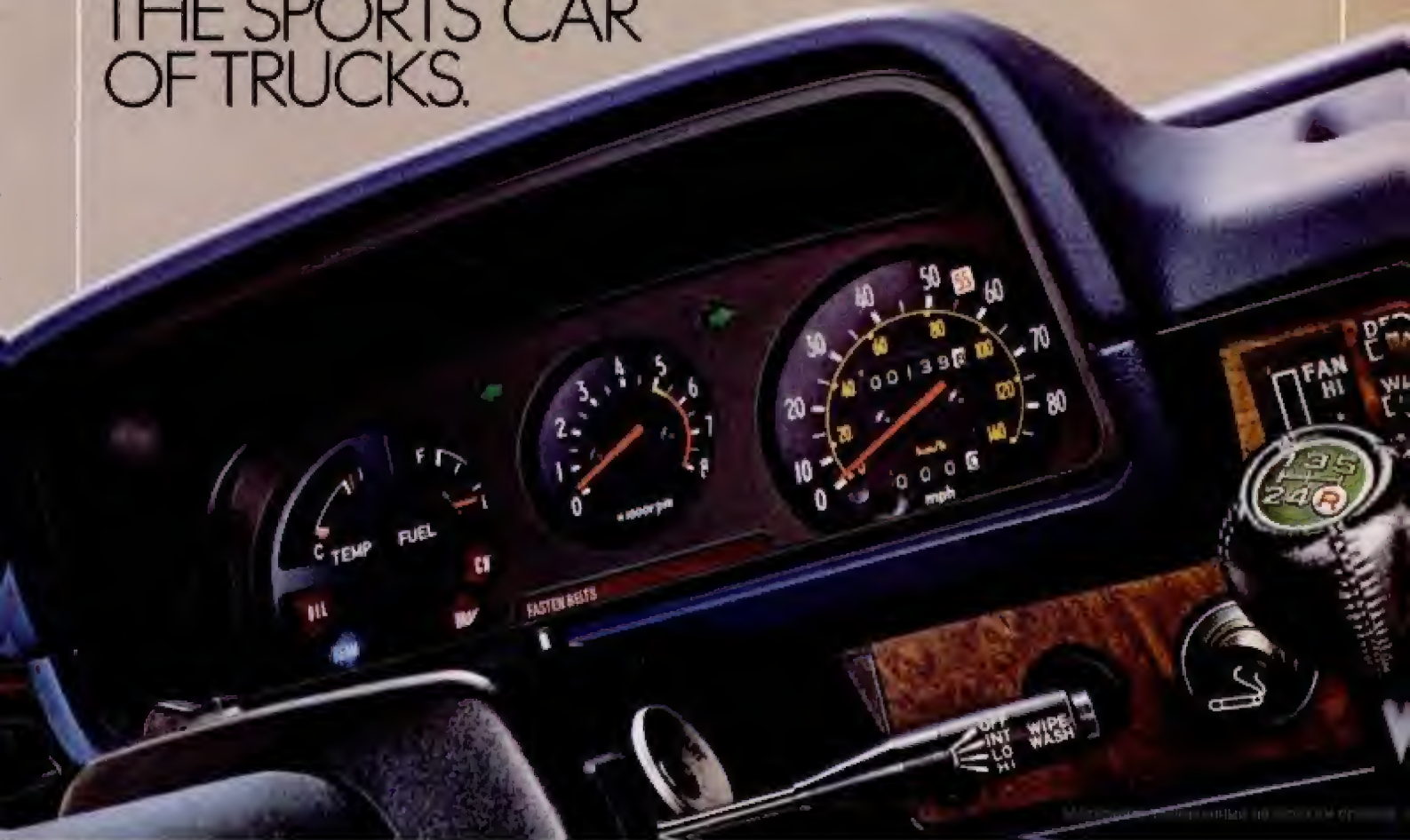
It pulls hard, yet the 5-speed shifts into gear with a light, precise feel many genuine sports cars can't match.

The standard power assisted front disc brakes snug the SR-5 to a clean stop, but there's hardly a pip from the tight, all-welded cab. And the standard AM/FM stereo radio, full carpeting, and blacked-out

instrument faces enhance the sporty atmosphere inside.

Everything working in harmony—that's the feeling the Toyota SR-5 Sport Truck shares with good sports cars. *PICKUP, VAN & 4WD Magazine* got the feeling. They put it this way, "...this is how a small truck built by BMW would drive and feel if BMW built small trucks."

THE SR-5 SPORT TRUCK.
THE SPORTS CAR
OF TRUCKS.



CAR CLINIC

(Continued from page 58)

ing "Electrical" for those which apply to your vehicle.

Precious problem

I own a 1979 Buick Regal with the V6 turbocharged engine, and I'd like to know the best way of removing spark-plugs. Space is limited, especially on the passenger side of the car, and I've been told that the turbo pipes have to be removed before plugs can be removed.—John L. Precious, Long Island City, N.Y.

Someone's pulling your leg, John. Well, maybe not. The job looks tougher than it is. Get yourself an offset ratchet and short extension, and you shouldn't have too much trouble removing plugs while avoiding the torture of first removing turbo pipes.

By the way, I know this has nothing to do with changing plugs, but it's a good time to remind you to faithfully follow manufacturer engine oil change period recommendations for this engine. Change oil every 3000 miles. A spokesman at Buick told me his department is starting to see turbochargers with bad bearings. Turbocharger bear-

ings fail, primarily, because oil breaks down. With a turbocharged engine, oil breakdown begins at 3000 miles.

Scratching paint

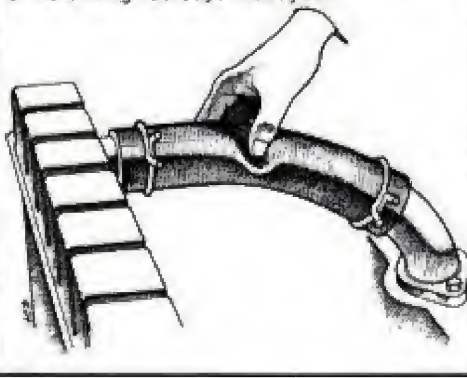
I have a problem with the paint job of a 1974 Ford Mustang II, which I recently bought used. I can scrape the paint off with my fingernail. People tell me that in 1974 Ford tested paint mixtures, and this led to a batch of bad paint jobs. Is the rumor true? What do you suggest I do?—Robert M. Runyon III, Drayton Plains, Mich.

In 1974, Ford used new paints on the Thunderbird and Mark IV, not on the Mustang. Ironically, though, in 1974 Ford issued service instructions to dealers concerning peeling paint. However, as far as *Car Clinic* is concerned, there has not been an abundance of mail from Ford owners complaining of paint problems.

Service instructions suggest that if paint peels, a so-called flash primer should be used when repainting with acrylic lacquer. Says Ford: "This material provides the adhesion necessary for paint to adhere and prevent recurrence of peeling." Ford recommends two flash primers

Good advice from Goodyear

According to a recent informal survey by *The Wall Street Journal*, the price of gasoline has forced more motorists to garage their cars and find alternate means of transportation. This raises an interesting point. Although a car may not be used as much as before, its rubber products continue deteriorating. So says Goodyear Tire and Rubber Co. The point is: Don't take drive belts and cooling system hoses for granted, just because you've cut your driving by 10, 25, 50 or 75 percent. Check hoses for cracks and a spongy feeling, and check belts for frayed edges and cracking as often as you did before. You can expect these parts to start breaking down two years after being installed, driving or no driving. So says Goodyear.



Lok*Backs

from
CAMILLUS

Experience, skill and unparalleled pride is clearly reflected in this NEW line . . . each a true masterpiece. Ounce for ounce the finest folding lock-backs on the market today.

They come in 3 sizes, each with etched blade of high-carbon stainless steel that automatically locks in open position, functional design, and hand-contoured wood handle. No. 2 bolsters are solid nickel silver . . . No. 3 and 4 are solid brass. Gift packaged with top-grain leather pouch.

Available at your local sporting goods or hardware dealer. For complete catalog, send \$1.00 to:

CAMILLUS CUTLERY COMPANY

Dept. E, Camillus, New York 13031



No. 4
Size closed:
4 3/4 in.

No. 2
Size closed:
3 1/8 in.

No. 3
Size closed:
4 1/8 in.

made by Ditzler. They are primer sealer DL-1970, which is neutral gray, and primer sealer DL-1947, which is clear. Both are available from a Ford dealer. When using either of the two, you don't have to strip the finish. Just sand enough to smooth the area, and apply primer followed by acrylic lacquer.

The chair recognizes D.R.

Can I use your column to thank Chevrolet and also to offer your readers advice? I have a 1977 model equipped with a 305-cu.-in. engine that has been driven only about 6000 miles.

Starting when the car was new, the oil would turn completely black within 300 miles of an oil change. When I questioned the dealer service department about this, I was told that the color was normal and that this could be blamed on the pollution control gear.

A year after I bought the car, the engine developed a noise. When the mechanic removed the valve covers, he scolded me for not having changed oil, but I had service bills to prove that oil had been changed at three-month intervals and also that I had been complaining of a problem with the oil. At this point, I insisted that

the zone office send a factory representative to resolve the problem. This gentleman discovered a cracked valve guide, which was allowing gasoline and engine oil to mix. Repairs were made and the oil now looks great.

My advice to your readers is, if they buy a new car, they keep all service bills, no matter who does the work. With the bills, they can document complaints and maintenance, and have a leg to stand on when bringing a problem directly to the manufacturer. In my case, the engine was repaired free of charge, although the car was out of warranty six months. Please don't use my name or town if my comments appear. Just sign me—A Devoted Reader.

Thanks, D.R., but let me add something. If you do your own servicing, save the receipts for the products you buy, such as for oil and filters. Keep a diary of when services are done. This will help convince the

GOT A PROBLEM WITH YOUR CAR?

Just ask Mort about it. Send your question to the Car Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. While letters cannot be answered individually, problems that are of general interest will be published in the column.

man that recommended services were performed during the warranty period.

SERVICE TIPS

■ What do you do with an empty CO₂ tire inflator after pumping up the stowaway spare? GM offers three choices: Get the inflator refilled by the dealer; if he can't accommodate you, get it refilled at a fire extinguisher shop; if this fails, exchange the empty inflator for a filled one (the dealer should be able to do this for you).

■ If you hear what seems to be a transmission moan from your 1979 AMC Spirit, Concord or AMX with V8 engine—but only in winter when the heater is being used—have your dealer install a nylon restrictor (part No. 3219619) in the heater core inlet tube. The restrictor solves the problem without affecting heater operation.

■ Cadillac is advising mechanics that the knock you may hear from your diesel engine may not be the spark knock you think it is. It could be piston knock. To find out which it is, retard injection-pump timing as much as possible. This action will quiet down a spark knock, but not a piston knock.

■ Chrysler Corp. has an informative folder for you on how to save fuel when driving any size car. It's free and can be obtained by dropping your name and address to Gas Saving Tips, Box 970-A, Detroit, Mich. 48232. **PM**

NEW DREMEL BELT SANDER & DISC SANDER IN ONE.

The ingenious combination of a quiet-running, 5" disc sander and 1" wide x 30" long sander-belt makes this the most useful power tool you'll ever own.

The disc handles rough sanding and shaping. The belt sander takes care of the finishing.

3" throat depth, easy belt adjustment make inside sanding simple. Has a platen that provides a rigid sanding surface if you need it but removes for flexible belt sanding.

Great tool if you don't have a workshop. Great tool if you do. Available wherever fine power tools are sold.

Dremel, Division of Emerson Electric Co., Racine, WI 53406.

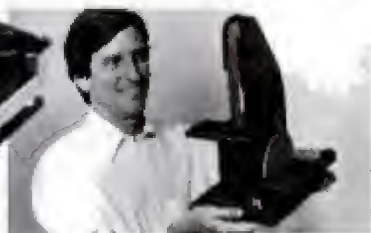
YOU'LL NEVER RUN OUT OF USES FOR IT.



Sharpens, polishes, cleans, grinds metal, wood, some plastics.



Large tilting table, adjustable miter gauge for sanding accurate angles.



Compact. Weighs just 11 lbs. Only 15" high x 10" x 11".

DREMEL®

DETROIT LISTENING POST

Turbo Trans-Am pace car

Following on the heels of last year's 10th Anniversary Pontiac Trans-Am Daytona 500 pace car will be a specially designed, charcoal-on-white pace car for the 1980 Indianapolis 500.

With the exception of the unique paint and striping design, the car will be a basically standard, 4.9-liter turbo V8 Firebird Trans-Am. However, it also will have a special hood scoop and "fire-breathing" decal design, silver-tinted hatch-roof panels, white aluminum "airflow" wheels, 3.08:1 limited-slip differential and automatic transmission. The new turbocharged engine is rated at 210 hp at 4000 rpm and 345 foot-pounds of torque at 2000 rpm.

About 6300 replicas of the Indy pace car will be built for sale (except



Limited-edition, 210-hp, turbocharged Pontiac Trans-Am will be the pace car at the 1980 Indy 500. Top speed: 120 mph.

in California, where the turbo 4.9 is not certified for that state's tougher emissions standards), according to Pontiac general manager and General Motors vice president Bob Stempel.

The standard equipment will include four-wheel disc brakes, halogen headlamps, airconditioning, power windows and a specific interior with red instrument lighting, AM/FM stereo radio with cassette tape and a leather-wrapped Formula steering wheel. The Indy pace car decals will be available through Pontiac dealerships.

Flywheel-powered bus

In the far-flung-future department, we have General Electric working on a petroleum- and pollution-free flywheel-powered city bus, under contracts from the federal Departments of Energy (DOE) and Transportation (DOT). The concept involves equipping a full-size transit bus with a 3000-pound steel flywheel operating in a sealed, low-pressure helium atmosphere. The flywheel is connected to a motor/alternator

that generates electricity to drive a 150-hp propulsion motor.

Range between flywheel charges will be only about 3.5 miles, but getting the flywheel back up to speed will take just 90 seconds, and curb-side recharging stations would be closely spaced. Claimed advantages are clean, quiet, efficient, exhaust-free operation, plus long operating life and low maintenance.

News from GM and Ford

GM is planning an inexpensive, front-drive subcompact, smaller than the Chevette, for U.S. introduction in 1985. It's dubbed "S-car," and a version of it could be the first production electric car in GM showrooms.

Pontiac Div. is working on a mid-engine, two-seat sports car and looking for corporate approval to produce it in the mid-1980s. It would have a plastic body and use the 2.8-liter, V6 engine from the "X-car" (Phoenix), but it would be a mid-engine, rear-wheel-drive design, like Fiat's X 1/9. Considering the fate of previous sports-car proposals from GM divisions, it's unlikely to get the corporate nod, unfortunately.

Ford, meanwhile, is developing a smaller version of its fuel-saving, four-speed automatic overdrive (AOD) transmission for use in cars smaller than the 1980 Cougar and T-Bird. It should be ready by 1983.

More on alternate fuels

There's a small but growing trend toward conversion of cars and trucks to either propane or natural gas, which can be accomplished at a cost of \$1000 to \$2000 per vehicle (See *Saturday Mechanics: Converting Your Car To Propane*, page 48A, Sept. '79, for details). Both are clean burning and cost less than gasoline, but their present use is mostly limited to large fleets, due to fuel availability and other problems.

There are only 25,000 propane dealers in the United States, and you'd have to build your own refueling station to run on natural gas. Also on the negative side, both natural gas and propane have less energy content than an equivalent amount of gasoline, meaning lower fuel mileage and performance; both can be highly dangerous if improperly handled; finding qualified service on the road for either system is

next to impossible. For the firsthand story, though, Mort Schultz will report in a future issue his experiences involved with finding and using propane.

More practical as a way to stretch gasoline supplies someday may be a product called HydroFuel, which is being tested by Avis Rent-A-Car System Inc. Developed more than 10 years ago by United International Research Inc. of Hauppauge, N.Y., HydroFuel is an unspecified mixture of unleaded regular gas and alcohol in solution with water, plus a special stabilizer, Hydrelate, which acts to prevent separation of the liquids.

Avis says test results have been encouraging so far in a fleet of 30 management cars, but there are no plans as yet to try the stuff in rental cars. No word on when or if HydroFuel might be marketed to the public.

RV maintenance manual

There's no point in trying to sell that motor home as long as people are worried about fuel availability and cost. So you might as well keep it in tip-top shape and enjoy it when you can.

Toward that end, a new *Motor Home Chassis Service Guide* has been prepared by RV specialists at Chrysler. It puts into "layman's language" some of the more simple do-it-yourself maintenance and repair procedures that a motor-home owner can make on his recreational vehicle or chassis."

The booklet is being given away at Chrysler-sponsored service seminars at National RV Rallyes and shows; or send \$5 to Manager, Technical Services, Chrysler Corp., Service and Parts Div., Box 1718, Detroit, Mich. 48288. **PM**



BY
GARY
WITZENBURG

Vertical thinking from Audiovox: the first complete, one-piece sound system for your 1980 Chevy Citation.

And some horizontal thoughts
for the other GM X-body automobiles.

GM only makes a vertical radio for the Citation. Audiovox makes the only vertical radio/cassette or radio/8-track unit for the Citation (and they make it in one piece).

Audiovox engineering overcame the problems of space and gravity that GM couldn't. Not surprising – Audiovox produces auto sound systems, not automobiles. Instead of a separate under-dash tape player, the Audiovox units are designed in one piece. And it wasn't simply a matter of turning a conventional unit on its ear – gravity won't stand for that.

Audiovox does – Detroit doesn't.

When you buy a new car, Detroit offers countless options. When you buy a sound system for that new car, Audiovox offers more options than Detroit has ever heard of. So why settle for a car manufacturer's radio if you can choose an S.P.S. by Audiovox. Like the 5 different vertical one-piece sound systems for your 1980 Chevy Citation or one of 64 other S.P.S. systems for all



Available at new car dealers only.

new cars. And Audiovox guarantees your S.P.S. stereo for the life of your car, Detroit *doesn't*!

All this and a lifetime warranty.

Audiovox is the *only* manufacturer to offer a *lifetime* warranty on all of its S.P.S. auto sound components. Should a component from one of these systems malfunction during the warranty period due to a manufacturing defect, it will be replaced without cost, except for removal and installation costs. The lifetime warranty remains in effect for as long as you own the car.

The Audiovox S.P.S. sound systems were developed in the audio research laboratories of Shintom Co., Ltd., Yokohama, Japan.

*For further information, write to:
R. Harris, Technical Director
Dept. 10K, S.P.S. Division
Audiovox Corporation, 150 Marcus Blvd.
Hauppauge, NY 11787.*



Got a ceiling problem?

Cover it up! Dress it up! Light it up! Quiet it down! With a new Armstrong suspended ceiling.

Whatever your ceiling problem—covering up an old or damaged ceiling, adding a new room, or finishing off a basement—an Armstrong suspended ceiling is a problem-solver with style. Beautiful. Washable. Fire-retardant for extra protection. Acoustical to help quiet down any room. Preengineered for energy-efficient fluorescent lights.

Best of all, with an Armstrong suspended ceiling, like Royal Oak shown above, solving your ceiling problem is a do-it-yourself project. There are no staples or glue to mess with, no plastering or sanding. The big 2' x 4' ceiling panels simply drop into the color-matched Super White Grid. The ceiling is easy to install and easy to keep looking fresh and new. If a panel gets damaged, just lift it out, and lay in a replacement.



If lighting is a problem, you can install Armstrong fluorescent fixtures with the ceiling . . . for lighting where you want it, not just where the builder put it.

You can install a beautiful new Armstrong suspended ceiling almost anywhere in your home. Briefly, here's how:

Hang the Armstrong Super White metal runners about three inches below your existing ceiling or open joists (about six inches with light fixtures).

Snap the Armstrong Super White cross tees into the main runners, and lay in the ceiling panels. It takes some time, but it's easy. You can do it!

See your Armstrong ceiling retailer for a broad selection of suspended ceilings. Find him under "Ceilings" in the Yellow Pages. Or send us this coupon, and we'll send you his name and a free full-color brochure.

Armstrong, Dept. 02RPM
Peoria, IL 61614

Please send me your new color
brochure on suspended ceilings.

Name _____
Street _____
City _____
State _____ Zip _____

Armstrong

CREATORS OF



THE INDOOR WORLD®

HINTS FROM READERS

Emergency tap wrench



A large turnbuckle can double as a tap-wrench handle in an emergency. Fit the square end of the tap into the turnbuckle. Then tighten the screws to hold the tap securely.—*Ken Patterson*

Stamp storage



A small plastic storage box having compartments and a transparent lid is handy to store stamps by denomination for easy identification.—*A. A. Reyner*

Solder secures blades

After you've coiled a bandsaw blade for storage, use short strips of solid, but soft, wire solder to hold the loops together. The solder will secure the blade without damaging the teeth—as regular wire can. When the solder finally does break from repeated use, it can still serve its original purpose.—*Howard E. Moody*

File guide

If you file your own hand saws, particularly the fine-tooth saws, blacken the teeth with candle smoke before you begin work. If you are then interrupted in your work, the discoloration will indicate the teeth that remain to be filed.—*Robert Stuman*

Important News For BACKACHE SUFFERERS!

Momentum® Tablets are 50% stronger than Doan's.

Before you take Doan's Pills for your muscular backache, remember this: Momentum Tablets are 50% stronger than Doan's Pills. That means Momentum gives you 50% more pain reliever per dose to relieve backaches.

For pain, inflammation, and stiffness of muscular backache, there's no stronger medication you can buy than Momentum Muscular Backache Formula.

Momentum does more than reduce

pain and soothe inflammation. It has a calative, too, to help relax tension that can cause muscles to tighten. Doan's has none. As pain is reduced, stiffness eases, you move more freely in minutes.

If you are taking Doan's, you are not getting all the pain reliever you get in Momentum Tablets. For relief of backache pain, just 2 Momentum Tablets give you the strongest medicine possible without a prescription. Take only as directed.



FINANCING
NO
PROBLEM!

Have you been priced out of today's housing market?

Miles Homes could be the answer!

If you have the ambition and desire to build your own home, then the Miles Plan could be for you. **THE MILES HOME OWNERSHIP PLAN IS UNIQUE.** Your desire and dedication are more important than ready cash — start now to build the home of your dreams...the Miles Way.

- 36 months to build.
- There is a representative near you. Phone: (612) 588-9700.

Miles has nearly 30 years experience helping over 15,000 families to build their own home. Send coupon today to see how Miles can help you.

- Liberal credit — Low monthly payments while building.
- Foundation assistance.
- Land may not have to be fully paid for.
- Pre-cut materials, blueprints, **step-by-step instructions.**

Miles Homes

12 Inland A Division of Inslco Corporation

Send me your **FREE** Great Homes Idea Book.

MILES HOMES, Dept. 0210
4500 Lyndale Ave. N., Minneapolis, MN 55412

Name

Address

City State Zip

County

Phone

I plan to do ☐ all or ☐ part of the work

☐ \$1.00 enclosed for priority handling

MPMO



Who could blame you?

CHIVAS REGAL • 1.75 LITER BOTTLE • 12 YEARS OLD WORLDWIDE • BLENDED SCOTCH WHISKY • 86 PROOF • GENERAL WINE & SPIRITS CO., N.Y., N.Y.

PHOTOGRAPH BY ADRIAN M. BROWN FOR CHIVAS REGAL

New heat pump lowers your hot-water bill



Compact heat pump connects to an existing electric water heater, can rest on floor, mount on shelf or be hung from ceiling.

If you have an electric water heater, you can cut your operating costs in half or more. This is the good word for a new heat pump, the first of its kind, that attaches easily to any existing electric water heater. Called Efficiency II, it's a trim, compact add-on that looks and works much like an air conditioner. It extracts heat from the air and feeds it to the water tank, thus relieving the regular heating coils of much of their load.

According to its maker, E-Tech Inc., the heat pump can reduce a water heater's electric consumption by 56 to 70 percent, saving \$150 or more a year for a family of four. Installation takes only an hour or two, using ordinary tools. Price is \$549 from E-Tech Inc., 3570 American Dr., Atlanta, Ga. 30341.—S.M.G.



Test setup comparing heat pump with conventional electric hot-water heater shows unit can cut costs more than 50 percent.



Quick! Name 13 energy savers!



...your assurance of quality

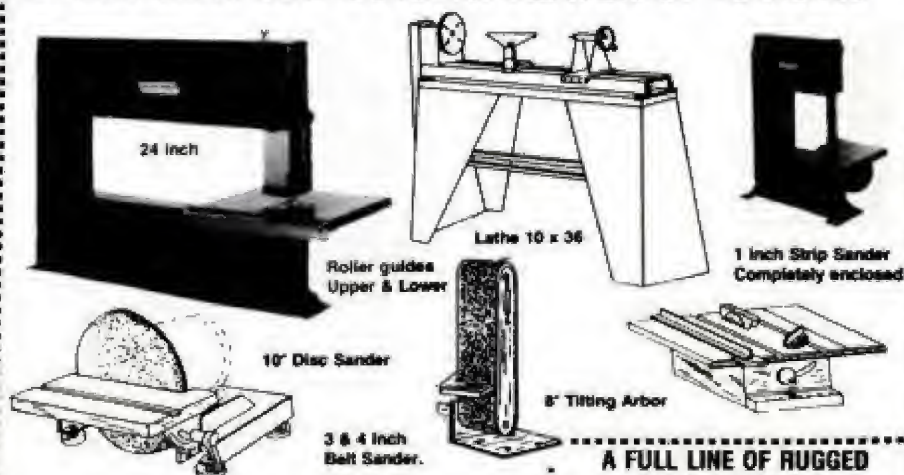
the GIBSON-HOMANS company

1756 Enterprise Parkway • Twinsburg, Ohio 44087 • 216/425-3255

FACTORIES: Twinsburg, Ohio; Malawan, New Jersey; Conyers, Georgia; Tampa, Florida; Des Moines, Iowa; Gretna, Louisiana; Kansas City, Missouri; Portland, Oregon; Richmond & Vernon, California; Ennis, Texas; Malton (Toronto) Ontario, Canada; Boucherville (Montreal) Quebec, Canada.



24 inch Band SAW CUTS TO CENTER OF 48 inches



DU-ER TOOLS — RUGGED ALL STEEL — BALL BEARING — EXTRA VERSATILITY

Du-er's 24 inch Band Saw gives the handyman the versatility of an industrial tool at a price he can afford, the quality that is demanded by industry. The Band Saw, one of the best cutting principals for wood, metal or plastic, has been limited in use because of the depth of throat. The B-24's Big throat and new drive feature gives longer blade life, cuts metal, wood or plastic.

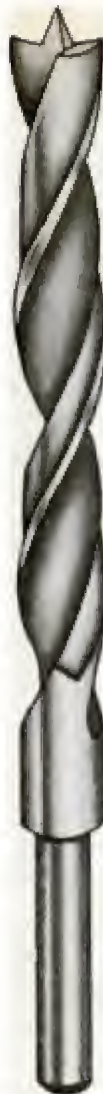
Du-er tools are fabricated of Heavy Gauge Steel, 30 years experience developed new engineering features with accuracy, and ball bearings for added quality. Extra features created by manufacturing know how makes Du-er tools available at exceptionally low prices, yet no quality is sacrificed.

You can order direct from Factory where there is no Dealer represented ... Free Information. F.O.B. factory

A FULL LINE OF RUGGED ALL STEEL TOOLS:

24 inch Band Saw	199.95
12 inch Band Saw	159.95
10 x 36" Rugged Lathe Ball Bearing	89.95
3 inch Belt Sander Ball Bearing	24.95
4 inch Belt Sander Ball Bearing	39.95
8 inch Tilting Arbor Saw	99.95
10 inch Disc Sander Table Model	69.95
1 inch Strip Sander	69.95
Deluxe Stand for all Tools	39.95

DU-ER TOOLS, 5448 Edina Industrial Blvd., Minneapolis, Minn. 55435.



NOW, For The First Time- Use The WOODBITS The PROS Use!

PROFESSIONAL WOODBITS are NOT available in hardware stores. Stores only carry spade bits which tear grain, clog and bind; or metal-cutting twist bits that also bind and — what's worse — "skate" off the mark.

Why is a WOODBIT Best?

A PROFESSIONAL WOODBIT has four features designed specifically for wood:

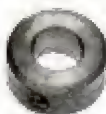
- A CENTER SPUR that locks your bit on course and so prevents "skating".
- TWO CUTTING SPURS that start and dimension a perfectly round hole.
- EXTREMELY SHARP FLUTES extend from the two cutting spurs and continue the cutting action all the way through the wood... shaving the sides smooth. Most important, the two spurs will not splinter the wood as the bit cuts through... as spade or metal cutting bits do.
- THE CUTTING FLUTES ARE ENGINEERED for maximum chip ejection so that your drilling machine won't bind and burn out.



LEICHTUNG'S PROFESSIONAL WOODBITS can be used in portable drills or drill presses with chucks of $\frac{3}{8}$ " or more. 7 piece chrome-vanadium steel set includes $\frac{1}{8}$ ", $\frac{3}{16}$ ", $\frac{1}{4}$ ", $\frac{5}{16}$ ", $\frac{3}{8}$ ", $\frac{7}{16}$ " and $\frac{1}{2}$ " sizes. Lengths from $2\frac{3}{4}$ " - $5\frac{1}{4}$ ". Made by German professionals for pros or "wood-be" pros.

7 PIECE WOODBIT SET ONLY \$15.95

Depth Adjusting Collars For The 7 Piece Set



Get the precision of a costly drill press for under \$10.00! Here's how they work: Figure the desired depth of the hole; slip the collar over the bit to that depth; fix the collar position with the set screw — and drill. 7 collar sizes, $\frac{1}{8}$ " - $\frac{1}{2}$ ", fit each bit in the 7 piece woodbit set. Tool steel.

7 Piece Depth Adjusting Collars ONLY \$9.95

Buy Both Bits And Collars And SAVE \$2.00..... ONLY \$23.90

Complete Your Bit Set With These 4 BIG WOODBITS

Primarily for use in a drill press, these larger diameter bits can be used $\frac{3}{8}$ " Bit... \$10.95 in any powerful portable drill with a $\frac{3}{8}$ " or larger chuck. These are $\frac{3}{4}$ " Bit... \$12.50 really top quality professional cutting tools. The $\frac{3}{8}$ " bit is $7\frac{1}{2}$ " long, the $\frac{1}{2}$ " Bit... \$13.95 $\frac{3}{4}$ ", $\frac{7}{8}$ " and 1" are $7\frac{7}{8}$ " long. No collars available. 1" Bit... \$15.50

Buy All 4 Big Woodbits (SAVE \$12.95)..... ONLY \$39.95

COMPLETE 18 Piece Drill Set (SAVE \$16.80)..... \$62.00

18 Piece Set Includes:

7 Bits: $\frac{1}{8}$ " - $\frac{1}{2}$ "; 7 Collars to match plus 4 BIG WOODBITS: $\frac{3}{8}$ " - 1".



You Can Order **Call TOLL FREE 800-321-6840**
Tools By Phone: Ohio Residents Call: (216) 831-6191

Yes Ric Leichtung, please send me:

- ___ 7 pc. Woodbit Set(s) @ \$15.95
- ___ 7 pc. Depth Collars To Match Above Set @ \$9.95
- ___ 14 pc. Bit and Collar Set(s) @ \$23.90 (SAVE \$2.00)
- ___ $\frac{3}{8}$ " BIG Woodbit(s) @ \$10.95
- ___ $\frac{3}{4}$ " BIG Woodbit(s) @ \$12.50
- ___ $\frac{7}{8}$ " BIG Woodbit(s) @ \$13.95
- ___ 1" BIG Woodbit(s) @ \$15.50
- ___ All 4 BIG Woodbits @ \$39.95 (SAVE \$12.95)
- ___ Complete 18 pc. Drill Set(s) @ \$62.00 (SAVE \$16.80)

Shipping, Handling and Insurance **\$1.75**

Method of Payment

☐ Check ☐ VISA ☐ MasterCard

TOTAL

Card #

Good thru

Name

Address

City

State

Zip

LEICHTUNG
"THE Workbench People"

4944 Commerce Parkway # 280PM
Cleveland, Ohio 44128
Phone 216-831-6191



send your 68 page, 1980 color catalog of hard-to-find woodworking tools, PLUS all catalogs and new tool bulletins FOR THE NEXT TWO YEARS FREE!

☐ Enclosed is \$1.00. Please send your 1980 color catalog PLUS all catalogs and bulletins FOR THE NEXT TWO YEARS!

☐ Enclosed is my order for woodbits. As my BONUS, please

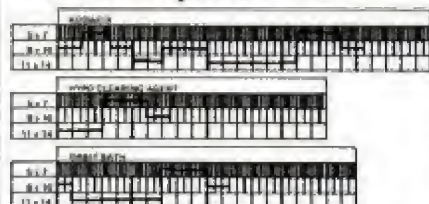
PHOTO HINTS

Clamp support



A small camera may be supported on many surfaces with a spring photo clamp. The swivel-bolt device is fitted with a bolt, which is then screwed into the tripod socket. —Ken Patterson

Chemical-depletion chart



This chart makes it easy to plot the depletion of photo chemicals. Using manufacturer's specs, compute the number of prints of each size obtainable from each batch of chemicals. Draw chart showing each print capacity and mark off the number of prints of each size as they are sent through each bath. When chart indicates solution is exhausted, replace with fresh batch. —Kenneth Brooks

Tape trick



When using your camera's self-timer or when making long exposures, light may enter the camera through the eyepiece if you're not looking through the viewfinder. To eliminate the problem, cover the eyepiece with black tape after composing and focusing. —Bob Berger

BEST BUY

TOP QUALITY AND POWER COMBINE
TO GIVE YOU THE FIRST AIR FRESHENING/
IONIZING SYSTEM THAT EVEN SAVES YOU MONEY

The Air Energizer shown above is the least expensive negative ion generator on the market, selling for only \$74.95. That's \$5 cheaper than our nearest competitor. It is also the best. If you are comparing units you need to know the facts. With the UTP Air Energizer you even get more for your \$5 less. We can charge less and give you a higher quality unit because we are a common ownership company. And we are in business to serve you and your environmental needs. Our major competitor is a mail order house that promotes dozens of products every year, but the UTP Ion Research Center is a branch of an educational publishing company. For the past several years we have researched and developed one special electronic product: negative ion generators. This specialization enables us to be the industry's frontrunners. And the System Five Air Energizer is our latest breakthrough in Air Ionization.

WHAT DO IONS DO FOR YOU?

Frankly, as marketing director I was pretty skeptical of our Ion Research team's work until one day two years ago when I was walking to work. The season's first thunderstorm had just ended. The air was sparkling clean and almost magically alive. I took a deep breath. The new energy in the fresh air made my head tingle. But as I walked into the office building where I work I immediately felt a drop in energy. The air was dull and lifeless—"stuffy feeling".

Was I experiencing what our Ion Researchers had been telling me all along for the last four years? I decided to test it. I put a UTP Air Energizer on my desk. Skepticism gave way to enthusiasm. I felt great. I still have that unit on my desk.

WHAT MADE THE DIFFERENCE

Have you ever wondered what makes this kind of difference in the air? It isn't just our attitude when we're out in Nature versus being in a crowded city. It isn't that it's a weekend and not a workday.

The difference lies in the electrical balance of the air or the quantity of "ions" present.

WHAT ARE IONS?

Ions are electrically charged atoms in the air with either a positive or negative charge. The sun and cosmic rays as well as lightning and fast-moving water (like waterfalls, surf) generate trillions of negative ions every day. The more negatively ionized the air, the fresher and more alive it is. Air pollution, artificially controlled climates (with air conditioning and heating) and electronic equipment all produce excess positive ions, depriving the air of these small negative air ions and creating dead "stuffy" air.

WHAT'S THE SOLUTION?

Our rapid-growth technology, which sometimes takes its toll on the quality of our air, has also come up with the solution. Following Nature's model of the thunderstorm which uses a high electrical charge to purify, revitalize and stimulate the air, the UTP Air Energizer has been developed imitating this process. Both the thunderstorm and the Air Energizer fill the air with negative ions, restoring the natural electrical balance to the polluted, energy-depleted air. But the Air Energizer can be used indoors in the home, office, work-shop, laboratory, etc., keeping a fresh supply of ionized oxygen flowing from its emitters night and day. This new breakthrough in fresh air control is not a cover-up which masks or deodorizes, but the unit actually removes the dust, smoke, bacteria and pollen particles from the air by attaching ions to them and causing them to sink to the earth where they can be vacuumed up rather than inhaled. At the same time ions electrically stimulate the energy-stripped air.

MORE FOR LESS

Why do we say you get more for less money? A typical marketing technique is to take your weakness and assert that it is one of your strengths. This is exactly what our competitor has done. Their ads proclaim the wonders of "miracle fuzz", the bronze fuzz ball emitter on their unit. But using bronze fuzz and calling it a new invention is really old hat. It was first introduced in England many years ago. In fact we ourselves brought out a bronze fuzz unit called System Three over a year ago because it's cheaper than needles. But we are discontinuing it because we want to maintain our reputation for the highest quality, and stainless steel emitter needles are so much better. A single, large fuzz ball emitter is difficult, if not impossible, to clean. It quickly gets so dirty that its efficiency is reduced. We are the only manufacturer we know of that uses *self-cleaning* stainless steel emitter needles.

YOUR CHOICE OF TWO TOP-QUALITY UNITS!

There's only one unit that's better than System Five. That's our own System Four. It sells for \$159. It has an even higher ion output. Plus! Our special *Dial-An-Ion* allows you to adjust the ion output anywhere from low to high. Not everyone knows that the need for ions varies. A large smoky room will require higher output than a small room. And some people want fewer ions while sleeping than while working. The new System Four is our answer to this need for output flexibility. And we're the first and only ones to offer this special feature at this price. If System Four is better why did we bring out System Five?



SYSTEM FIVE

Not everybody is willing to pay \$159 for an air ionizing unit, no matter how good it is. Just like not everyone drives Rolls Royces. Most drive less expensive cars.

System Four is for the person who wants the absolute best quality and doesn't mind paying a little extra to get it. If you want highest ion output, flexibility, and a beautiful oak paneled case, buy System Four.

If you want something at half the price of System Four, but still better than any other units costing up to \$250, buy System Five.

HOW TO GET ONE

To place your order now just send a check for \$74.95 plus \$3 shipping for System Five. Or send \$159 plus \$4 shipping for System Four. Tell us your full street address as we cannot ship to Post Office boxes.

Our unit is dependable and trouble-free, but if by rare chance any problems occur our service-by-mail center sends off your unit within 24 hours of receipt or sends a replacement so you are not without fresh air and can enjoy your dust-free environment. And each Air Energizer is backed by a full one year limited warranty.

HOW TO GET ONE FAST!!!

Credit card holders can call our toll-free number below. Order a unit now and if you are not satisfied with its effects within 10 days simply return it for a full cash refund. Order your Air Energizer today.

UTP

Read "The Golden Egg"

University of the Trees Press
ION RESEARCH CENTER
BOX 644 PM, BOULDER CREEK, CA 95006
Call Toll-Free . . . 800-538-0750
In California call (408) 338-6663
Send check or use your Master Charge,
Visa or American Express card.

WE HAVE ION DETECTORS!

Now you can prove to yourself which unit has the highest output. These high quality, low cost detectors enable you to do scientific tests and comparisons. Our *Econometer* contains a neon light that blinks in the presence of negative ions. The more ions, the faster it blinks. The *Ionometer* gives you a sensitive meter to compare readings between units. The *Ionoscope* gives you three sensitivity ranges for advanced and accurate detection.

ECONOMETER . . . (pen size) . . . \$7.50

IONOMETER . . . (3"x2"x1 1/4") . . . \$49.95

IONOSCOPE . . . (5 1/2"x3"x1 1/4") . . . \$99.95

Add \$2.00 per detector for shipping.

5 mg. "tar", 0.5 mg. nicotine av. per cigarette by FTC method.

© 1979 R. J. REYNOLDS TOBACCO CO.

DORAL II

Only 5 mg tar.
No other cigarette with
this little tar...

...has this much taste.



ONLY **5** MG TAR

Get what you never had before:
Satisfaction with ultra-low tar.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

APPLIANCE CLINIC

QUESTIONS ANSWERED

Searching for universality

Is there some all-universal home appliance parts storage depot where homeowners can purchase parts? It seems that five years after an appliance is marketed, you can't get parts. For want of some inexpensive components, consumers have to discard perfectly good washers, dryers, refrigerators—the list is endless.

Are some companies more accommodating than others? If so, you should tell us which they are, so we can buy from them and avoid the offenders of "planned obsolescence."—C.C. Cromley, Chantilly, Va.

Most appliance manufacturers maintain an inventory of spare parts for a minimum of 10 years following discontinuance of a model. In fact, manufacturers usually provide parts for at least 15 years. Maybe you aren't going to the right supplier for your parts.

Although there is no single universal parts storage depot that stocks all parts (none that we've been able to uncover, anyway), there are many companies throughout the country that provide replacement parts for many models. A list of these was provided in the April '78 *Appliance Clinic*. If you can't find a supplier in your area, we suggest you get in touch with one from another area. Most of the companies on the list we provided have mail-order facilities.

Facts on vacs

I think I have a problem with a Sears Wet and Dry Pickup Home and Shop Vac. The first model I bought (758.17885) leaked air from the rim of the tank and cover. Sears service, saying the vac was defective, replaced the unit with a bigger model (758.17871). This one, too, has air escaping from around the full circle of the cover. However, suction is good. When I put my hand over the nozzle, the amount of air escaping from around the rim diminishes.

Neither the Sears sales staff nor the service department seems to have a solution. Everyone has a different opinion. Can you give me a straight answer? Is this machine defective, too?—Peter J. Canarelli, Bethpage, N.Y.

No, and neither was the first vac you had. Sears vacs are supposed to "leak" air around the rim. In fact, the rim is part of the exhaust system

and the vac is designed to exhaust about 25 percent of its total exhaust from the rim.

Don't compare this Shop Vac with a conventional vacuum cleaner. The Shop Vac has tremendous force—in fact, it moves over 200 cu. ft. of air per minute (cfm), as compared to 70 cfm for the average home vacuum cleaner. Exhausting, therefore, plays an important part in the machine's operation.

When you put your hand over the nozzle, you are reducing the load on the vacuum, so it isn't moving as much air as it normally does. This accounts for the reduction in exhaust. When the exhaust is reduced, so is the amount of air escaping around the rim.

Giving support

Glasses in the upper rack of my KitchenAid Model KDR-66 dishwasher don't come clean most of the time. Neither do fruit dishes, saucers and plates. I feel there isn't enough water pressure to spray the upper rack. Repairmen have not corrected the problem. Please help.—Mrs. James E. Wallace, Webster Groves, Mo.

Your theory about low water pressure may be valid, but the most common cause of this problem is low water temperature. Unless water is 140° to 160° F., the detergent won't break down, and food will remain on dishes.

If water temperature is at the proper setting, chances are the wash-arm support is loose, cutting down on the amount of water pressure the wash arm delivers. Replace the wash-arm support. This entails removing the wash arm, fine and coarse strainer assembly and wash-arm support. It is not a difficult job, but if you need help, write KitchenAid for service literature: Customer Relations Dept., KitchenAid Div., Hobart, Troy, Ohio 45374.

Life begins at 20

Our General Electric top-loading dishwasher Model ISU-60P leaks water from the top of the tub. A new rubber gasket provided by GE was installed, but water still leaks when the machine starts its washing cycle and also during the rinsing cycle. What can I do? The machine works fine, except for the leak.—Mrs. Harry A. Sikma, Chicago

That's saying something, since this dishwasher is about 20 years old. One or both of two problems may be present. First, perhaps the gasket wasn't installed properly. This gasket isn't the easiest to secure. If it isn't stretched sufficiently, it has a tendency to roll in toward the tub. Lacking the proper contour, the rubber gasket may be allowing the water to leak.

The second possible problem is that the spring of the spring-loaded top cover may have weakened in 20 years. If so, the cover may not be closing tightly enough to keep water from leaking, although you are pulling the lever that closes the cover as hard as you can.

On a hunch, I'd replace the spring, too. Who knows? The machine may be good for another 20.

'Boiling' refrigerator

The compressor of my Whirlpool side-by-side refrigerator, which is only two years old, was recently replaced. Now, when it shuts off, a noise resembling the sound of boiling water comes from the tubing for about a minute. The noise wasn't there before the replacement. The serviceman tells me pressure is equalizing. Please advise me on how to solve this problem.—Ted M. Niec, West Miffler, Pa.

It's true that some equalization of pressure takes place in the system, but if you didn't hear noise before the refrigerator was repaired, you shouldn't hear noise now. The tubing may have accidentally been misrouted, or there may not be ample charge in the system.

If this repair was made by an authorized Whirlpool representative, call Whirlpool headquarters in Michigan. The company will contact the service technician. Together, they will make sure the refrigerator is operating as it should.

Call, toll-free, 800-253-1301. If the repair wasn't made by an authorized Whirlpool service technician, call anyway. Whirlpool may suggest an appropriate course of action for you to follow. **PM**

If you have a question about any appliance, send it to Appliance Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Sorry, but letters cannot be answered individually. Problems of wide interest will be discussed in this column.

These four matched volumes tell you and show you everything any building or carpentry job...from fixing a roof to building even building an addition or a house!

Take this 4-volume CARPENTERS AND BUILDERS LIBRARY

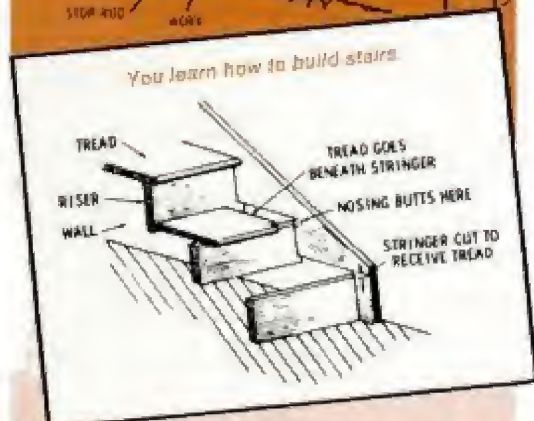


FOR
ONLY

\$295

(regular price
\$24.50)

when you join
Popular Science Book Club



How Popular Science Book Club Works

Just mail the postpaid card to get your \$24.50 4-VOLUME CARPENTERS AND BUILDERS LIBRARY. Send no money now. We'll bill you later for only \$2.95 plus delivery and handling.

Then, about every four weeks (15 times a year), you'll receive a Club bulletin describing the coming main selection and alternate books also available, all at Club discounts. If you want the main selection only, do nothing. It will be sent automatically. If you don't want the main selection, or want alternate books, or no books, please make sure to indicate your wishes on the Instruction Form and return it to us by the date shown. Club mailings are carefully scheduled to assure you of at least 10 days in which to do this. But in the unlikely event that you don't have 10 days, and you receive an unwanted selection, you may return it at our expense.

After receiving your joining shipment, your only obligation is to buy two more regular selections or alternates in the next year. After that, membership may be cancelled at any time, by either you or the Club.

DISCOUNTS UP TO 50%. All books are offered at substantial discounts—up to 50% or more. Yet virtually every book is identical to the publisher's edition. Same paper, printing, binding, jacket. The only difference is price.

AS A CLUB MEMBER, you'll have an opportunity to choose from more than 100 superb, up-to-date books on a wide range of popular science subjects every year—**AT DISCOUNTS OF UP TO 50%.** (And your only obligation is to buy two of them.) You'll be offered books on home improvement, repair and workshops, remodeling, house building, energy and insulation, wiring, plumbing, cars and car repair, electronics, appliance repair, furniture building, machines and technology and many other home handyman subjects.

This information-packed 4-VOLUME CARPENTERS AND BUILDERS LIBRARY brings you professional, easy-to-understand how-to on just about every build-it-yourself question you'll ever have...

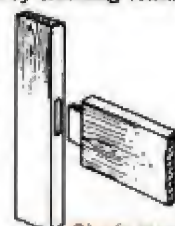
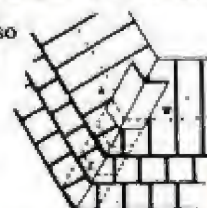
- You get a complete how-to book on woods and woodworking tools, how to do all kinds of joinery and cabinetmaking joints, how to do kitchen cabinet construction... and more.
- You get a complete how-to book on all standard specs of every element in house construction, including how to read plans and make your own... how to lay out a home workshop... and more.
- You get a complete how-to book on laying out the foundation, how to do concrete block construction, house framing, chimneys, fireplaces, porches, patios, insulation... and more.
- You get a complete how-to book on every aspect of roofing, flooring, doors, windows, stairs, plus how to use stationary and portable power tools, plus tips on painting, maintenance, repairs, termite protection... and more.

You get step-by-step instructions on everything from reading a building plan to building a house (including the foundation), doing all the carpentry in it—and keeping the house in A-1 shape for a lifetime. And thousands of show-how pictures make it all amazingly easy, even for a novice. Let's look at a few of the remodeling and fix-it jobs you learn how to do... You learn how to replace worn or missing shingles. How to fix chimney flashing leaks. How to repair stairs (or build them from scratch).

If doors need fixing or fitting, you can find out how to do it from these books. If you want to lay new flooring, you can just turn to these books to find out how to do a first-rate job with wood-tile, linoleum, asphalt, rubber or ceramic tiles. If you want to build a fireplace, you'll find out exactly how from these books...

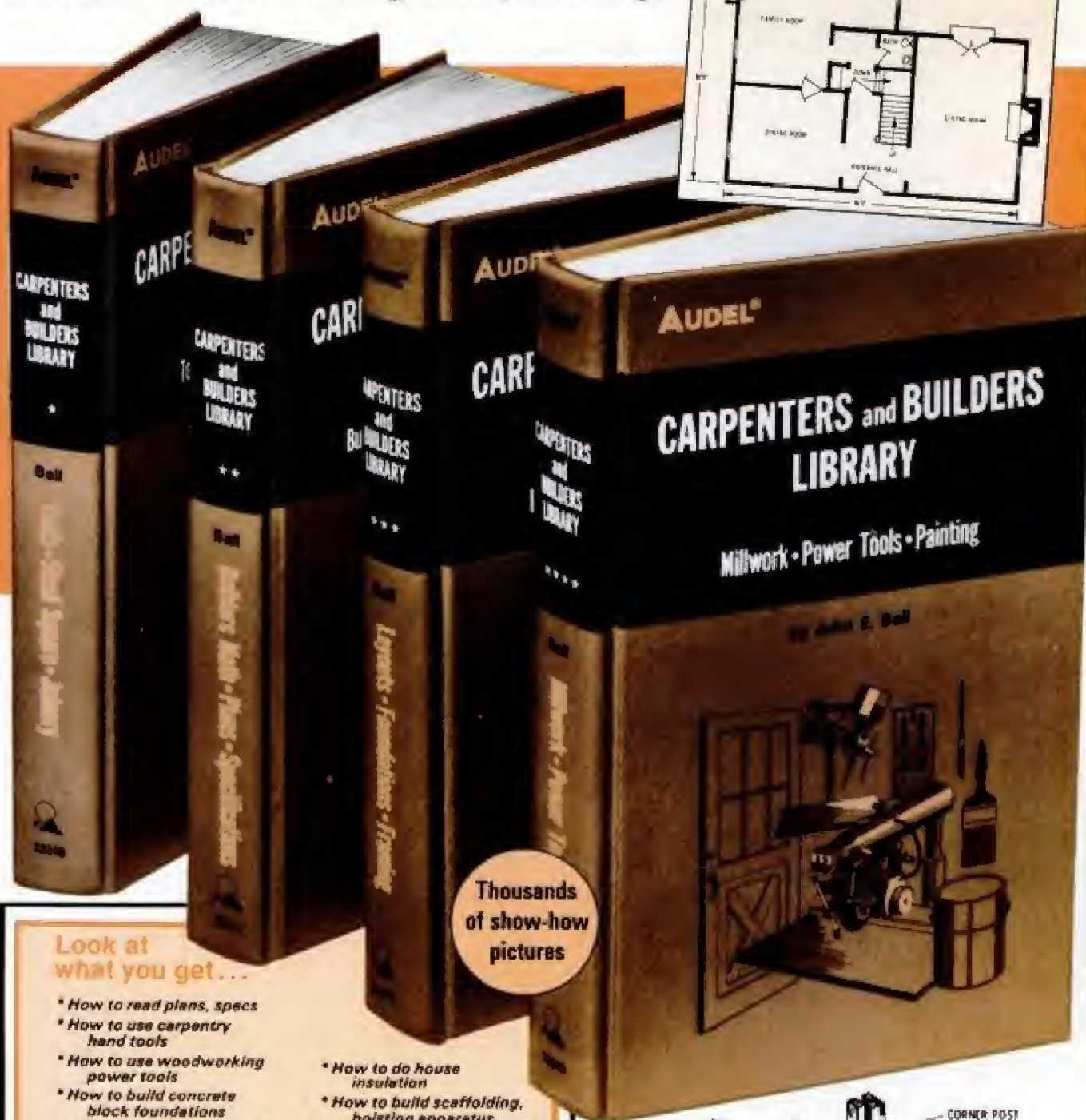
This marvelous 4-book library also tells you how to use all kinds of power tools to maximum advantage (most of them have great versatility). You learn about woods—their characteristics, strengths, best uses. You learn about fasteners—nails, screws, bolts, more—their holding power, size-strength ratio, and how to use each.

These books teach you scores of tricks and shortcuts used by carpenters for measuring, cutting, raising, fastening, finishing—every technique and job. They give you the answers to just about every carpentry question you'll ever have. And they can save you thousands of dollars in the years ahead.



Installing metal shingles under wood shingles.

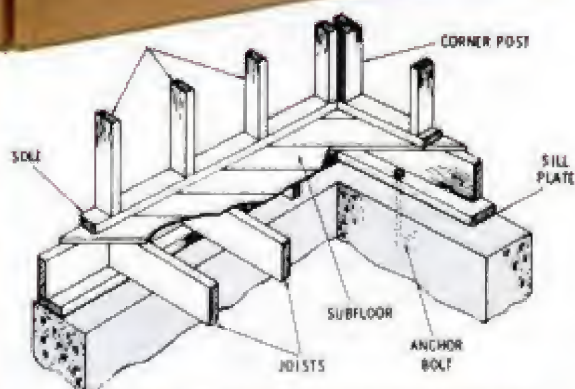
***you need to know to do just about
a foundation, installing new paneling,***



**Thousands
of show-how
pictures**

**Look at
what you get...**

- * How to read plans, specs
- * How to use carpentry hand tools
- * How to use woodworking power tools
- * How to build concrete block foundations
- * How to choose best woods, materials, fasteners
- * How to plan and build roofing, flooring
- * How to construct walls, doors, windows
- * How to make joints
- * How to build stairs
- * How to build chimneys and fireplaces
- * How to use builders' math, do surveying
- * How to make kitchen cabinets, counters
- * How to do cabinetmaking joinery
- * How to build A-frame, 1- and 2-story houses
- * How to plan a home workshop
- * How to do house insulation
- * How to build scaffolding, hoisting apparatus
- * How to do wood pattern-making (for castings)
- * How to do sheathing and siding
- * How to do cornice construction
- * How to plan termite protection
- * How to do interior-exterior painting
- * How to build girders and sills
- * How to make concrete forms (and molds)
- * How to sharpen saws
- * How to build skylights
- * How to do house maintenance and repair
- ...and much more



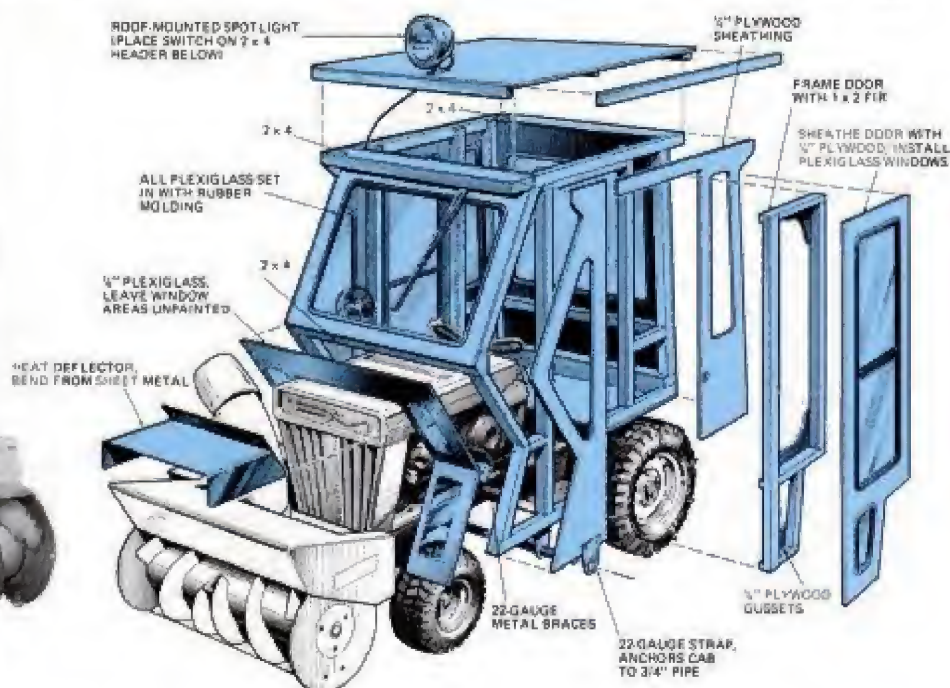
MAIL THE ATTACHED CARD OR WRITE TO

Popular Science BOOK CLUB
P.O. Box 2006, Latham, N.Y. 12111

Homebuilt tractor cab takes the bite out of snowblowing



Easy-to-make plywood tractor cab keeps driver warm in severest Midwest winters.



Clearing snow after a Michigan blizzard can be a cold, miserable job even with a tractor-propelled snowblower. After one rugged winter of braving freezing temperatures and facefuls of wind-whipped snow, I was determined not to go through another without some kind of tractor cab for protection. But cabs for small yard tractors aren't easy to come by. The few accessory cabs available for some models can't readily be adapted to fit other makes.

The answer was the homebuilt cab you see here. It's basically simple, yet sporty-looking, costs very little to make, and keeps me warm, dry and comfortable in the coldest, stormiest Midwest weather. And it's handy in summer, too. While it can be quickly removed if you wish, I find it offers welcome shelter against blazing sun and sudden cloudbursts.

Planning the cab

The cab is designed to fit my particular tractor—a Pennsylvania model—but can be altered to suit most other tractors of the same general size and type. The main attachment member is a piece of 3/4-in. pipe fastened to the tractor frame just ahead of the footrests. Its length is determined by the width of the tractor at the rear wheels.

The front of the cab is supported entirely by this pipe and is anchored to it by metal straps, as shown in the

drawing above. The back of the cab merely rests on the tractor's rear-wheel fenders with no attachment necessary, making installation and removal simple. For tractors that have no fenders, or where the fenders aren't strong enough to take the weight, a second pipe can be fastened to the tractor's frame at the rear to support the back of the cab in the same way as the front.

To plan the cab's layout, I used a primitive but effective method that will work with any tractor. With the help of my son, I held a piece of 1/4-in. plywood up against the side of the tractor, level with the front support pipe, and traced on the locations of the control levers, footrest and rear fender. Then I sat in the seat to de-

termine the desired headroom and other interior dimensions. The object here is to keep all controls inside the cab with plenty of room around them for your free, unobstructed movement.

Framing the enclosure

The plywood sheet, with the various locations and dimensions marked on it, thus provides an accurate pattern for cutting out the sides of the cab. The edges of the side panels and door opening are reinforced all around with 1x2 cleats on the inside. Cross rails of 2x4 stock join the sides together and support the roof, windshield and rear window.

The door is cut from one side panel. Do not saw it out, however, until all framing is complete. This will keep the side intact for greater structural rigidity and easier handling during assembly.

The windshield and windows are made of 1/4-in. clear acrylic plastic set into rubber car-window moldings obtained at an auto junkyard. The moldings make a trim, weather-tight seal and allow the windows to be slipped out easily in summer for ventilation. A heat deflector made of sheet metal channels warm air from the engine cowl into the cab. In summer, this, too, is removed. An electric wiper from a junkyard keeps the windshield clear, and a roof-mounted spotlight shines where you're going. Now snow removal is almost fun.—Kenneth G. Poeder



Roomy cab encloses operating controls, is readily entered through large side door.

Long-range luxury. 1980 Ford LTD.



LTD Country Squire

Best mileage of any full-size wagon.

Fifty years of Ford wagon technology come together in the 1980 LTD. It's versatile, good-looking and practical with even better mileage than last year—the best of any full-size wagon.

17

EPA
EST.
MPG

24

EST.
HWY.
MPG

For comparison excl. diesels and other Ford Motor Co. wagons. Your actual mileage may differ depending on speed, distance and weather. Actual hwy. mileage will probably be lower than est. Calif. mileage lower.

Unsurpassed room.

No wagon sold in America has more passenger or cargo room than LTD. Based on EPA volume index (112 cu. ft. passenger, 53 cu. ft. cargo). And LTD Wagons are rated to tow up to 6,000 lbs. with an optional towing package.

See your Ford Dealer and ask about the Extended Service Plan.



Better ideas for
the 80's FORD.

FORD LTD

FORD DIVISION



340-Mile Est. Range; 480-Mile Est. Highway Range. Based on LTD's 20-gallon gas tank and EPA mileage estimates. Your range may differ. Actual highway and California range will probably be lower.

P R N D 3 1

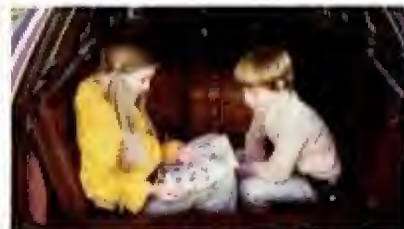
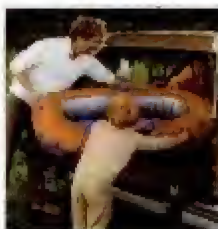
Automatic Overdrive Option. First fully automatic transmission with the benefit of overdrive on an American car.



LTD Luxury. Optional Interior Luxury Group shown with rich velour cloth, available in super-soft vinyl or optional leather.



Cargo Room. With the tailgate down, you can actually slide in a 4' x 8' sheet of plywood ... flat.



3-Way Tailgate. Dual Facing Rear Seats. Tailgate swings open like a door or down like a platform. Dual facing rear seats, an exclusive Ford Motor Co. option, provides seating for two or an extra 7.7 cu. ft. of under-floor stowage (with seat cushions removed).

**NEW
INVENTION**



**Beat the Gas
Pump and Improve
Your M.P.G. with**

Gastell™

**The gas and money
saver that really works!**

- Improves mileage up to 30%
- Government Tested
- Audio signal tells you of fuel wastes
- Quick and easy set-up

**Make any car more fuel-efficient
with Gastell™**

You don't have to be told that gasoline costs are skyrocketing. And all of us want to help conserve. But now there's a low cost, truly effective way to stretch your mileage and your gas dollars *without driving less!* It's called **Gastell™**.

How it works

Simply stated, **Gastell** is a revolutionary new electronic vacuum gauge that emits an audible signal when gas is being wasted by improper acceleration. **Gastell** actually monitors the intake manifold pressure to tell you if pressure is too low to allow full combustion of the fuel entering the carburetor. *By correcting acceleration, you conserve gas that would otherwise be passed through the exhaust system as unburned vapor.*

A constant and reliable fuel saver

In start and stop traffic, driving up and down hill, going around corners, on the expressway, in virtually every driving situation, **Gastell** instantly tells you if you're wasting fuel. And because **Gastell** features an audio signal, as well as a visual one, your eyes never need leave the road. *For safety and savings, Gastell makes great sense!*

Proven effective in independent tests

Unlike many gimmicks and gadgets you may have seen advertised that try to capitalize on the gas crisis, **Gastell** is a low-cost, totally reliable fuel saver that independently-conducted tests have proven to be truly effective. **Gastell** provides an immediate solution to the problem of wasted gas—it can actually im-

prove your miles-per-gallon by up to 30% without reduced engine performance! What's more, **Gastell** also gives warning of faulty ignition, carburetion or spark plug performance. It's completely safe for any car engine.

For every person, every car!

Gastell is conveniently designed in preset 4, 5, 6 and 8 cylinder models and arrives with all electrical, vacuum and mounting hardware, as well as quick, 1-2-3 instructions. Very easy, 15 minute installation.

Use it for 30 days—and SAVE!

The remarkable fuel-saver **Gastell** is available during our special introduction for just \$39.95. Use it in your own car for 30 days and if not totally convinced that **Gastell** is THE ANSWER to the fuel shortage, simply return it and we'll send you a prompt, courteous refund.

Credit Card Customers

Order Now—

Call Toll-Free

800-228-5440

(In Neb. call 800-642-6777)

**CAMBRIDGE
INTERNATIONAL, Inc.**

8700 Waukegan Rd. Morton Grove, IL 60053 (312) 966-5510

Clip and Mail To: Dept. M12

☐ Please send me _____ Gastell(s) at \$39.95 each plus \$3.95 shipping and handling. (Ill. residents add 6% sales tax).

☐ Please indicate number of car cylinders:

☐ 4 ☐ 5 ☐ 6 ☐ 8

☐ Check or Money Order enclosed.

Charge to: ☐ Master Charge ☐ Carte Blanche

☐ Visa ☐ American Express ☐ Diners Club

Account # _____ Exp. Date _____

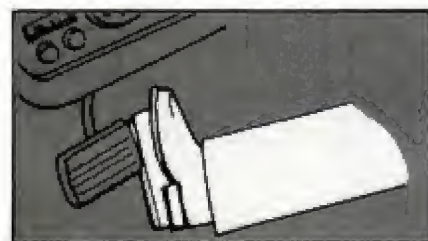
Name _____

Address _____

City _____ State _____ Zip _____

Signature _____

© Cambridge International, Inc. 1980



Improper acceleration can waste up to 30% of your car's fuel supply. **Gastell** prevents that with an audio signal that tells you you're wasting gas. It's the low-cost solution to the energy crisis!



A protective front flange on the plug face and stricter specifications for blade dimensions are some new UL requirements.

UL pushes for safer appliance power cords

Special safety features on all indoor extension cords and supply cords for kitchen appliances are now required by Underwriters Laboratories. The requirements were made to minimize the risk of children sustaining electrical burns.

The program is intended to reduce accidents in which a teething child mounds the connection of an appliance cord and an extension cord, or sucks the unused end of an extension cord. It is also meant to reduce accidents in which an older child, who can't separate an appliance plug and an extension cord, yanks them apart with his mouth.

Specifically, the requirements call for designs that will: 1) ease mating an appliance plug to an extension cord; 2) make it easier to grip a plug and 3) reduce the likelihood of contact with live parts.

To accomplish these goals, UL engineers are requiring manufacturers to: 1) comply with stricter specifications for both blade dimensions and performance tests that monitor how easily a plug can be inserted into an outlet and how well it fits; 2) provide plug faces that are constructed with a front flange; 3) use larger outlets with contacts more deeply recessed in their slots than previously and 4) provide closures for unused extension cord outlets.

When purchasing extension cords and kitchen appliances, parents of young children should look for the features mentioned above. **PM**

EARLY TIMES. THE WAY IT WAS, IS THE WAY IT IS.



1870. The first transcontinental train trip.
On May 23, eight of the most elegant train cars America had ever seen steamed out of Boston for the Pacific Coast, with 129 distinguished guests aboard.

And when they gathered to celebrate in the mahogany-paneled smoker, what other Kentucky whisky would have been more appropriate than Early Times?

Today, its smoothness is just as prized. Because we're still slow-distilling it the same way we did in 1860. So you don't have to look back to the good old days. You can look forward to its great taste tonight.

86 OR 80 PROOF, EARLY TIMES DISTILLERY CO., LOUISVILLE, KY.
© 1979.



1860
TODAY



Easy-to-make, metal-hardness testing device is a must for serious metal shops.

Anyone who works with metals knows that a hardness tester is a very useful device. If you know the hardness of a piece of metal to be turned in a lathe, you can save valuable time setting the feed and speed. There is no guesswork in determining the correct rake and relief angles to be ground on the bit for the most efficient cutting. Knowing hardness will also let you look up the yield and impact strengths of welds and metals. When overhauling an engine, hardness tests on reground valves and shafts can save you time and heartache.

Shop-made hardness tester for metalworkers

Although industrial hardness testers cost thousands of dollars, you can make a simple and inexpensive one in an hour for about \$1. It's portable so that you can take it to the job—and its accuracy is within 2 percent.

This testing device works because when a steel ball is dropped on a piece of metal, it will retain more energy and bounce higher the harder that metal is.

Making the tester

Theoretically, such factors as length of tube, inside tube diameter and ball weight will not affect the results. However, for practical reasons we suggest the dimensions shown in the diagram. The plastic tubing is available at plastic-supply houses. The $\frac{3}{16}$ -in.-dia. steel ball can be obtained from a discarded ball bearing.

Using the tester

First you must calibrate your tester and draw up a graph like the one shown. The slope of the line on your graph may differ slightly from ours since the steel ball you select may not be as hard as the one we used.

To calibrate your tester, obtain two pieces of metal with known, but different, degrees of hardness. Then calculate the percent of rebound of each by noting the rebound height and dividing by the original height. Plot the percentages against hard-

ness and draw a straight line through both points.

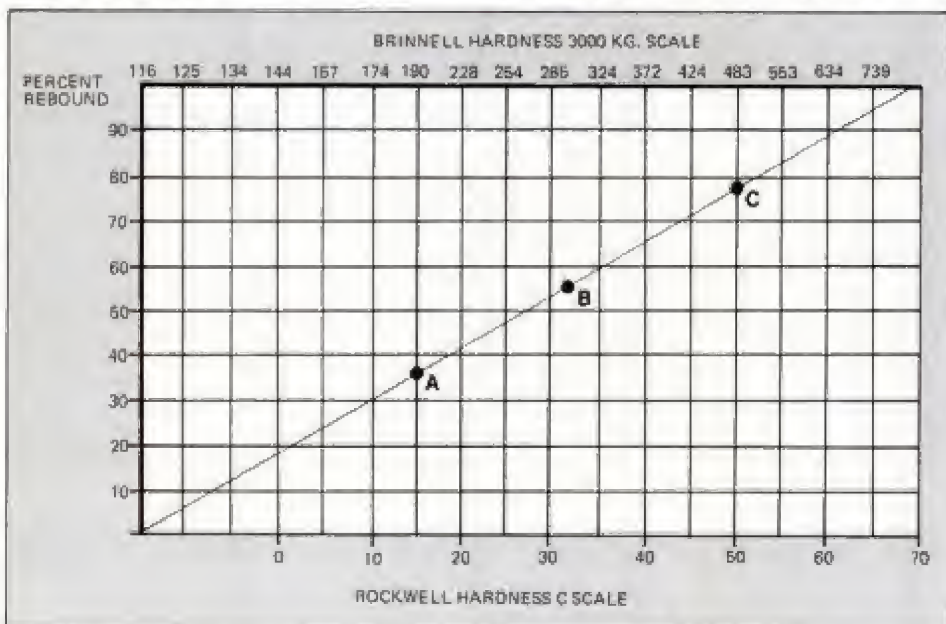
Hardness of any metal can now be read on the graph. Follow these steps:

- 1** Remove all rough machining marks from test piece by filing.
- 2** Remove all rust, scale, grease, and dirt from the test piece.
- 3** Keep the test piece level and firmly supported.
- 4** Hold the tester vertical.
- 5** Pull trigger to drop the ball and observe rebound reading on the scale.
- 6** Test in six places to get the *maximum* reading. Do not use the average of all readings.
- 7** Calculate percent of rebound and use graph to find hardness.

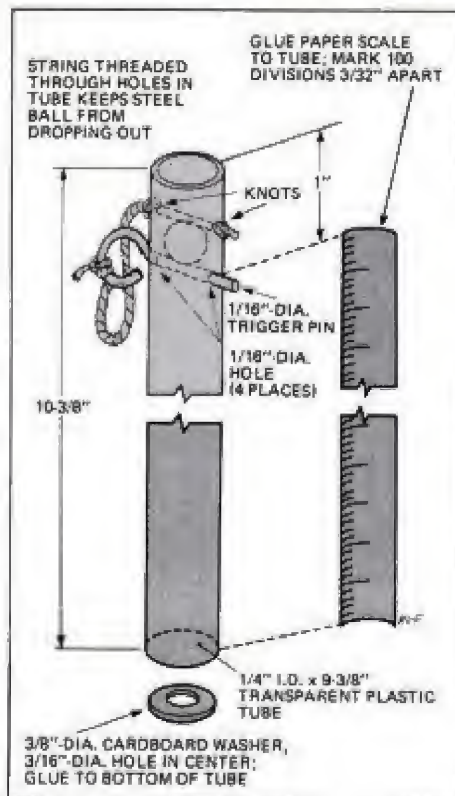
Neither this nor any other tester will give a correct reading in two cases. One is when you test a thin piece of metal not firmly supported. The metal will deflect from the falling ball, and this spring effect will give a low reading.

The second is when a piece is either surface work-hardened or surface annealed due to improper machining, polishing or heat treating. If you suspect this, file or machine the top layer in a place that does not affect the looks or operation of the piece and test there.

The list on the facing page will



Plot the percent of rebound of samples (A and B) with known hardness. Draw line through points. Then determine hardness of C by plotting its rebound on the graph.



help you identify metals once you have determined their hardness.—
Villy Diernisse

**Typical working hardness of
some metals**

AISI Steels	Brinell Hardness 3000-Kg. Scale	Rockwell Hardness C Scale
1020 Hot-rolled or annealed	120	
1021 Cold-rolled	160	6*
1040 Annealed	130	
1040 Hot-rolled	135	
1040 Cold-rolled	210	19*
1040 Heat-treated	250	24
1340 Heat-treated and tempered at 400° F.	539	54
2340 Heat-treated and tempered at 400° F.	534	54
4140 Annealed	185	13*
4140 Heat-treated and tempered at 400° F.	545	54
4340 Heat-treated and tempered at 500° F.	540	54
4340 Heat-treated and tempered at 800° F.	447	47
4615 Heat-treated and tempered at 350° F.	634	60
5140 Heat-treated and tempered at 400° F.	545	54
6145 Heat-treated and tempered at 400° F.	555	55
6620 Heat-treated and tempered at 350° F.	705	63
Tool Steels		
A-2 Heat-treated and tempered at 500° F.	634	60
A-6 Heat-treated and tempered at 350° F.	634	60
A-7 Heat-treated and tempered at 300° F.	705	63
A-8 Heat-treated and tempered at 600° F.	584	57
A-9 Heat-treated and tempered at 900° F.	601	58
D-2 Heat-treated and tempered at 450° F.	634	60
D-4 Heat-treated and tempered at 600° F.	634	60
D-5 Heat-treated and tempered at 400° F.	705	63
D-6 Heat-treated and tempered at 900° F.	634	60
D-7 Heat-treated and tempered at 900° F.	739	65
H-13 Annealed	217	19*
H-13 Heat-treated and tempered at 1050° F.	496	51
H-13 Heat-treated and tempered at 1100° F.	457	48
H-13 Heat-treated and tempered at 1150° F.	382	41
H-13 Heat-treated, tempered with nitride case		71
H-19 Heat-treated and tempered at 1050° F.	553	55
H-21 Heat-treated and tempered at 1100° F.	510	52
H-22 Heat-treated and tempered at 900° F.	510	52
H-23 Heat-treated and tempered at 1100° F.	424	45
L-2 Heat-treated and tempered at 500° F.	523	53
L-6 Heat-treated and tempered at 450° F.	634	60
M-2 Heat-treated and tempered at 1050° F.	739	65
M-3/1 Heat-treated and tempered at 1050° F.	739	65
M-3/2 Heat-treated and tempered at 1050° F.		67
M-7 Heat-treated and tempered at 1025° F.		67
M-10 Heat-treated and tempered at 1050° F.	722	64
M-42 Heat-treated and tempered at 1000° F.		70

(Please turn to page 84)

Rich Lights

from Viceroy



The rich low'tar' Kings and 100's.

9 mg. "tar", 0.8 mg. nicotine
av. per cigarette by FTC method.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

© 1984 B&W T Co.

**New products.
New features.
New technology.**



MERCURY OUTBOARD

**New for
1980.**



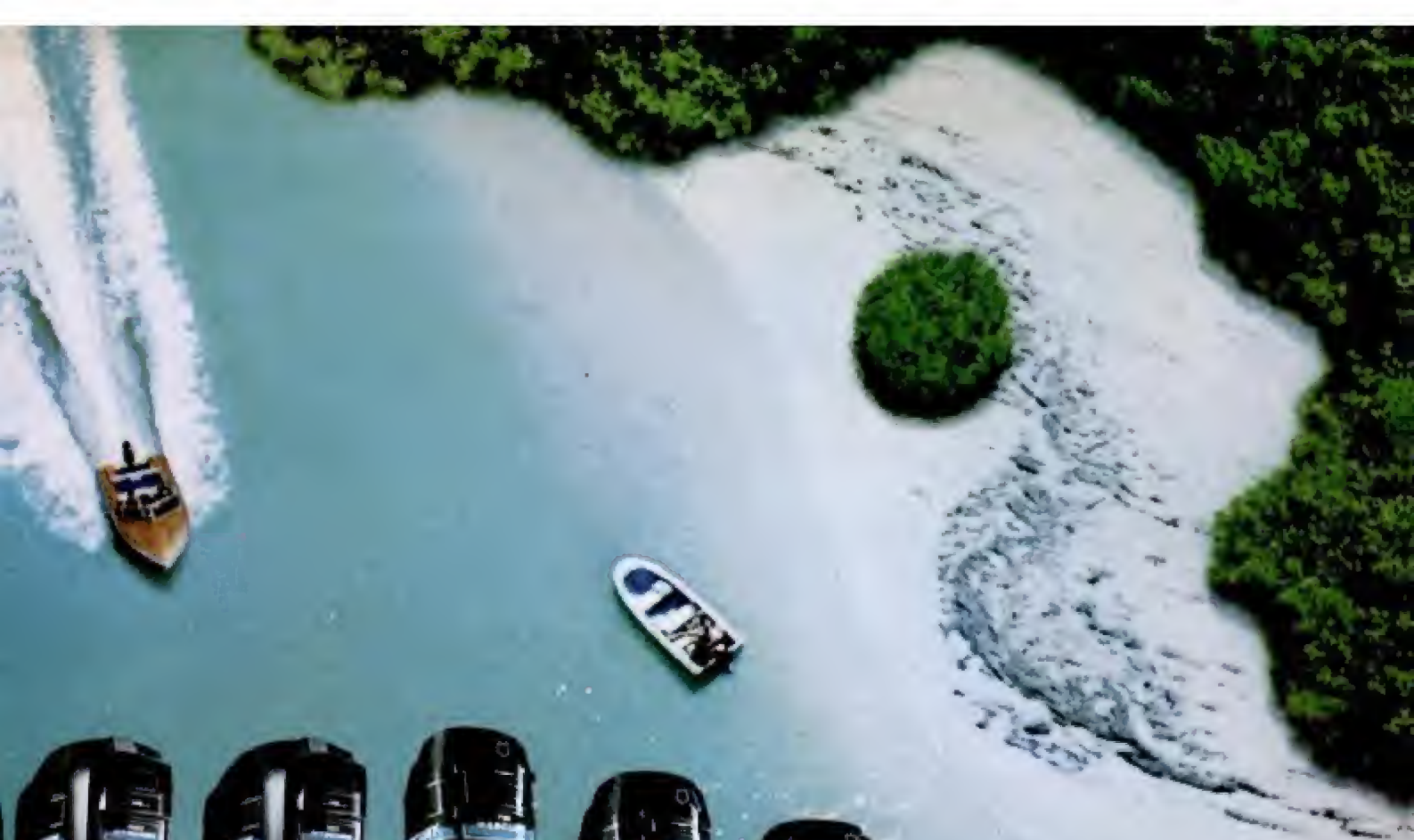
1980 is the year of the breakthrough for Mercury® outboards. Four new engines, three of them loop charged for better performance and fuel economy. Backed by 40 years of engineering for maximum reliability, and mechanical improvements throughout the line.

New Black Max.®

The new 225-hp Black Max V-6 Mercury delivers more power in a slimmer, lighter, more fuel-efficient design. And to handle all that power, it's engineered with a high-capacity, super-strong bearing system.

New Fishpower.™

The new 3.6-hp, 18-hp and 25-hp Mercs are compact power packages, designed for easy handling. The Merc 18 and Merc 25 are loop charged for better performance and fuel economy. And they're



BOARDS FOR 1980

specially engineered for fast and easy servicing — routine maintenance requires no special tools.

Mid-range improvements.

The redesigned 40-hp Merc runs quieter than ever, but with more power and better performance. The 70-hp Merc, too, provides more performance with a new higher rpm range and a new gear ratio.

For fishermen.

Sleek new slimline gearcase design and new prop designs for better weed-shedding. Engines that will troll for hours without fouling the spark plugs — and that includes the high-horsepower Mercs.

Breakthrough in corrosion resistance.

All critical parts are stainless steel or other tough, high-impact corrosion-fighting materials. And

a multi-step metal protection process provides an extra-hard corrosion-resistant paint finish. The result — the most corrosion-resistant outboards on the market, in fresh or salt water.

Match your needs exactly.

The 1980 Mercury line — more engines than ever before, and the broadest range of power in our history. Now you can match your needs exactly, for greatest fuel efficiency.

At Mercury, engineering leadership means we never stop making them better. We've given you just a few of the reasons here. Your Mercury dealer will be happy to give you the full story. Visit him soon.

MERCURY
OUTBOARDS

A BRUNSWICK COMPANY

Mercury Marine, Fond du Lac, Wisconsin, Canada, Australia, Belgium

How to cope with the high cost of heating:

HANDLE WITH KERO-SUN!



If you're frustrated by the high cost of heating, a Kero-Sun portable kerosene heater gives you low cost heat for only pennies an hour. Heats with almost 100% efficiency for 30 hours on less than 2 gallons of clean-burning, safe kerosene. Every Kero-Sun is thoroughly safety-tested. Each has a battery-powered igniter, so you need no matches to light it and each has an automatic shut-off — in case of tip-over. There's no smoke, no odor, and you need no chimney installation. This may be the winter when a Kero-Sun portable heater is your *only* way to handle the high cost of heating. Write for more information on the whole Kero-Sun line of heaters.

Please send me full facts about Kero-Sun portable heaters and the name of my nearest dealer.

Name _____
Street _____ City _____
State _____ Zip _____ Tel. # _____

KERO-SUN INC., MAIN STREET, KENT, CT 06757



P-20

SHOP-MADE HARDNESS TESTER

(Continued from page 81)

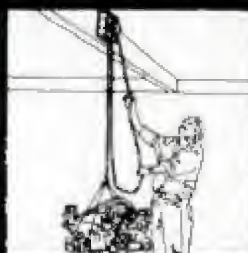
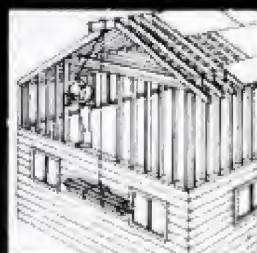
Tool Steels (continued)	Brinell Hardness 3000-Kg. Scale	Rockwell Hardness C Scale
M-43 Heat-treated and tempered at 1000° F.		70
O-1 Heat-treated and tempered at 400° F.	688	62
O-2 Heat-treated and tempered at 375° F.	688	62
O-6 Heat-treated and tempered at 400° F.	670	61
P-2 Annealed	100	
P-2 Heat-treated and tempered at 400° F.	688	62
P-4 Annealed	109	
P-4 Heat-treated and tempered at 1150° F.	634	60
P-20 Annealed	190	15*
P-20 Heat-treated and tempered at 1150° F.	300	32
P-20 Heat-treated and tempered at 400° F.	538	54
S-1 Heat-treated and tempered at 400° F.	568	58
S-2 Heat-treated and tempered at 300° F.	634	60
S-7 Annealed	197	17*
S-7 Heat-treated and tempered at 400° F.	601	58
S-7 Heat-treated and tempered at 500° F.	538	54
S-7 Heat-treated and tempered at 900° F.	483	50
T-5 Heat-treated and tempered at 1050° F.	739	65
T-8 Heat-treated and tempered at 1075° F.	739	65
T-15 Heat-treated and tempered at 1050° F.	739	65
W-1 Heat-treated and tempered at 200° F.		67
W-2 Heat-treated and tempered at 500° F.	634	60
Other Ferrous Metals		
Gray cast iron	150	3*
White cast iron	400	43
Malleable iron	120	
Maraging steel type 250 annealed	278	29
Maraging steel type 250 hardened	470	49
Maraging steel type 300 annealed	292	31
Maraging steel type 300 hardened	523	53
Maraging stainless steel annealed	254	25
Maraging stainless steel hardened at 900° F.	457	48
Maraging stainless steel hardened at 950° F.	445	47
Maraging stainless steel hardened at 1000° F.	435	46
420 Stainless annealed	175	10*
420 Stainless hardened, tempered at 600° F.	477	50
440 Stainless annealed	215	19*
440 Stainless hardened, tempered at 300° F.	560	56
Nonferrous Metals		
Aluminum	244	23
Brass (60% copper, 40% zinc) hardened	160	6*
High brass (66% copper, 34% zinc) hardened	183	12*
Red brass (85% copper, 15% zinc) hardened	163	7*
Bronze annealed	74	
Bronze hardened	166	7*
Beryllium copper 20 C cast	153	4*
Beryllium copper 20 C cast and aged	285	30
Beryllium copper 20 C annealed	112	
Beryllium copper 20 C annealed and aged	402	43
Beryllium copper 245 C annealed and aged	424	45
Beryllium copper 275 C annealed and aged	435	46

*These values are given for comparison purposes only.

The Easy Tugger™ Load Handler

profits soar from
gear technology breakthrough.

\$29.50



**Gear breakthrough
replaces ratchet catches.**

Use it as a winch.

Use it as a hoist.

**Use it with your electric
drill or socket wrench.**

**With the Universal Mount,
one winch does the job of
many.**

**Two-speed
transmission.**

Totally rustproof.

Saves time and money.

With a small investment in an Easy Tugger™ load handler you will increase profits by saving time, money, and trouble. The safety, convenience, and low price of the Easy Tugger™ is made possible by a revolutionary new breakthrough in gears and power transmission protected by a variety of U.S. and international patents including U.S. Patent No. 3,895,540. This new technology puts the old-fashioned winch and hoist in a class with the dinosaur—clumsy, unsafe, heavy, out-of-date.

Safest

Easy Tuggers™ are much safer than ordinary winches and hoists. A case protects fingers and knuckles. A replaceable shear ring prevents accidental lifting of oversize loads that might break the cable. There is at least a 400% over-design on all parts. And our **Load Handling Handbook**, included free with each Easy Tugger™, will make you a pro at pulling and lifting.

Strongest

Tool Master's Easy Tugger™ has the highest strength-to-weight ratio of any winch. The Easy Tugger™ body is designed to take an 8,000 pound load, and its cable has a safety factor of four times its advertised rating, and it has a totally rustproof case and drive unit.

Saves You Money

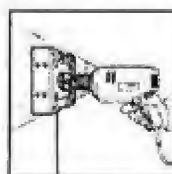
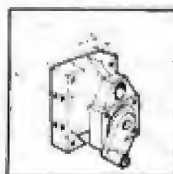
The Easy Tugger™ costs less and does more than the old-fashioned winch or hoist. Use an Easy Tugger™ to help on those jobs which would ordinarily require expensive extra labor, or a serviceman, jobs like repairing your own car or moving things around the house. Carry one next to your spare tire to pull your car out of a ditch or to use as an emergency tow cable. The Universal Mount, available separately, allows one Easy Tugger™ to be moved easily and quickly from one job to another.

The Easiest to Use

The hand cranked Easy Tugger™ can be driven by an electric drill or socket wrench and will adapt to virtually any load handling problem. The cable automatically locks in position with no ratchet catches. The Easy Tugger™ has an easy lifting two-speed transmission which gives maximum efficiency in handling light or heavy loads. You never waste time winding in the cable and the Easy Tugger™ is instantly ready to lift a heavy load.

Use It Everywhere

The Easy Tugger™ can be mounted vertically or horizontally, on just about anything; it can be attached with bolts, a chain, a hook, rope, stake, or trailer hitch. This load handler is a boat winch, a utility winch, a chain hoist, a ratchet hoist, a load binder, all in one.



You can take the motor out of your car with the same Easy Tugger™ you use on your boat trailer.

If you use tools, you need the Easy Tugger. The Easy Tuggers™ come in five models for every application—hand powered in ½ and 1 ton models, 1 ton "endless chain" powered, and 1½ ton 110V AC electric "Home and Shop Model," and 1½ ton 12V DC electric "Outdoor Recreation Model." Information on options will be sent with each order. Even if you already own a winch, you should order a copy of our **Load Handling Handbook**, for \$3.50 just to find new ways to use it.

No Risk Guarantee

Too good to be true? Try an Easy Tugger™ for thirty days without obligation. If you're not satisfied, just return it and your money will be refunded.

For Credit Card orders, call toll free

800 835-2246

Kansas residents call 800 362-2421.

Tool Master, Inc.

P.O. Box 2190

Boulder, Colorado 80306



Please send me:

**To: Tool Master, Inc.
P.O. Box 2190
Boulder, Colorado 80306**

☐ Check or money order enclosed.
☐ Mastercharge ☐ Visa Exp. Date _____

Acc't # _____

Signature _____

Ship to: _____

Name _____

Street _____

City _____ State _____ Zip _____

Because of demand please allow
45 to 90 days for delivery.

Made in U.S.A.

_____ ½ ton Hand Powered Easy
Tugger™ with 12' cable @ \$29.50
_____ 1 ton Hand Powered Easy
Tugger™ with 30' cable @ \$39.50
_____ 1 ton Deluxe "Endless Chain"
Easy Tugger™ with 30'
cable @ \$54.50
_____ 1½ ton 12V DC Electric Easy
Tugger™ @ \$99.50
_____ 1½ ton 110V AC Electric Easy
Tugger™ @ \$109.50
**Shipping and handling
add \$2.50 for each Easy Tugger™**
_____ Universal Mounts @ \$5.00
_____ Drill Adapter @ \$2.95
_____ Load Handling Handbook @ \$3.50
Colorado residents add 3% sales tax

Total Price _____

PM-2

ALL OUTDOORS

Family fishing

Probably one of the best family outdoor activities is fishing together. The kids want action, the adults like relaxation—and with today's new gear, the sport can provide both. By choosing suitable bait-casting, trolling, jigging, spin-casting, spinning or fly-casting equipment, the youngsters are challenged and can catch fish, as well. Those you won't eat may be released, and meanwhile the family small-fry have learned a life-time skill.

This spring many Evinrude motor dealers will be sponsoring "Take a Dad Fishing" activities, with instruction sessions, contests and clinics for parents and children together. It should be an ideal way to combine family companionship with a lot of outdoor fun.

Tenting out

If it never rains on your campground, if it's never too hot in the sun, never too cold at night, there are never insects or crawling creatures or you never just feel you'd like a little privacy, you can always unroll your sleeping bag right on the ground. Otherwise, the answer is a tent, as so many people going outdoors for a bargain vacation are finding out.

Tents still look much the same as those Omar the Tentmaker was stitching up 800 years ago, and newcomers to the outdoors don't appreciate the improvements of the last 25 years. Unless you have gone out in the middle of a rainy night to tighten ropes that are letting the leaky canvas collapse, broken a toe on a tent peg, tripped over a guy line and landed face down in the mud in the dark, you don't know how far modern tents have come.

Today's smaller models can pack in your backpack without breaking your back. Larger ones, big enough for a big family, can stow easily in one corner of a car trunk. But best of all, nearly every tent manufacturer we have checked this year makes models that can stand on their own. There's no center pole to encumber the inside, no network of perimeter ropes to surround it (and hold it semi-erect as they stretch and shrink with moisture). The new free-standing tents are rigid and light enough to be picked up and moved, when you find there are rocks under the spot where you unrolled your sleeping pad. All have the civilized

addition of floors, and peg loops around the outside edge to stake down your shelter if a wind threatens.

This breakthrough for sleeping out in comfort started about 20 years ago, when Bill Moss invented the Pop-Tent with its flexible fiberglass pole ribs that flipped it up and open with a quick push. Moss Tent Works of Camden, Me., now makes free-standing models in assorted sizes—their six-sleeper Trillium weighs only 13 pounds. Moss and others currently use fiberglass and also hollow aluminum poles with



Free-standing, lightweight tents, like White Stag's Sky Country, now set up fast, have added headroom and no interior poles.

shock cord inside so that they snap quickly into place. Light fabrics allow inner moisture to evaporate, a waterproof rain fly can keep out a downpour and some tent makers are using expensive, breathable Gore-Tex, as well.

If you've never tented out or only remember it from Army days, you should take another look at the modern designs for economical and energy-saving camping this coming year.

Snow shelter

Better than a tent for camping out in the winter is an igloo. It looks difficult to build, and is—unless you know the Eskimos' techniques. Then it becomes a warm and cozy shelter for snowbelt mountaineers, hikers, cross-country skiers, or anyone in a blizzard survival situation this time of year. The best instruction booklet is certainly *Igloo, Building Eskimo Snowhouses*, \$1.15 from Off Belay, 15630 Southeast 134th St., Renton, Wash. 98055. It tells such things as: how to get a snow saw, your most important tool (buy one, use a machete, or hacksaw one out of 2 x 18-inch stiff 1/8-inch alloy aluminum); how to build with pow-

der snow (tramp it down to pack it before cutting blocks); and how to make the quickest shelter (cover a trench with A-frame blocks).

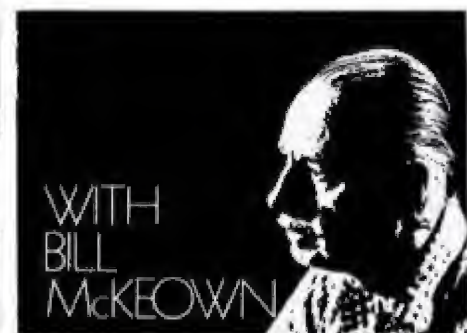
On-the-go guides

For warmer camping, Wayne Fears says that, "because swamps have suffered less from the pressures of progress than any other part of the American landscape, they constitute the last sportsman's paradise and nowhere will you find better hunting and fishing." To prove his point, he has just written *The Sportsman's Guide to Swamp Camping*, published by David McKay. Though it might not be your first choice for a vacation, Fears makes it sound more attractive as he explains how it is done.

Exceptionally attractive, and almost as welcome as a tax refund (which, in a way, they are), the new full-color publications for outdoorsmen from the U.S. Government Printing Office are special.

One example, *Stehekin*, is a description of Washington's North Cascade Mountains, prepared by the Interior Dept.'s National Park Service. It has 24 glowing wilderness photos and is the kind that would cost \$12 in a hard-cover bookstore. Instead, it's \$1.50. Another, from Interior's Fish and Wildlife Service, is *Migration of Birds*, a new \$4.25 update of an old standard. It includes modern radar measurements of geese that cruise at 60 mph and up to 29,000 feet and hawks that can dive at 200 mph. Long-distance records go to Arctic terns. They favor cool summers, and migrate over 11,000 miles between north polar regions and the Antarctic. Most of their lives are apparently spent in daylight in lands of the midnight sun.

Both books are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **PM**



Give any Manhattan the crowning touch.

Seagram's 7 Dry Manhattan.
To 1 part dry vermouth add 3 parts
Seagram's 7. Grace with
a twist of lemon.
Brilliant.



Seagram's 7 Classic Manhattan.
To 1 part sweet vermouth add
3 parts Seagram's 7 and a dash of
bitters. Top off with a cherry. Tops!

Seagram's 7 Perfect Manhattan.
To equal parts sweet and dry
vermouth add 3 parts Seagram's 7.
Bright idea!

Start out with the great taste of Seagram's 7 and
you'll always end up with a great Manhattan.
Any way you like them, enjoy our quality in moderation.

Seagram's 7 Crown
Where quality drinks begin.

SEAGRAM DISTILLERS CO., N.Y.C.
AMERICAN WHISKEY—A BLEND. 80 PROOF.

Manufactured by Seagram Distillers Co., New York, N.Y.



Handwriting is easily displayed with a computerized tablet like the Digikitizer.

Computerized sketch pad you build from a kit

A graphics tablet is a computer accessory that puts drawings onto a computer's screen and into computer memory. This new one for home use is easy to put together.

by Neil Shapiro ELECTRONICS EDITOR

Drawing with a computer can be a ticklish, involved process. Often, the simplest appearing figures call for the most advanced programming techniques. Now, there is a better way to put the computer to work in the design studio.

The Digikitizer from Talos Systems (7419 East Helm Drive, Scottsdale, Ariz. 85260) hooks up to an Apple II computer, or TRS-80, and allows you to draw freehand—no programming involved. It brings the computer one step closer to being a perfect tool.

Nothing could be simpler than entering a drawing into the computer to be displayed on the screen. All you have to do is to draw the figure you want (with a pen-like transducer) on the surface of the tablet-shaped Digikitizer, and the drawing shows up on the display.

On the Apple II computer, you can

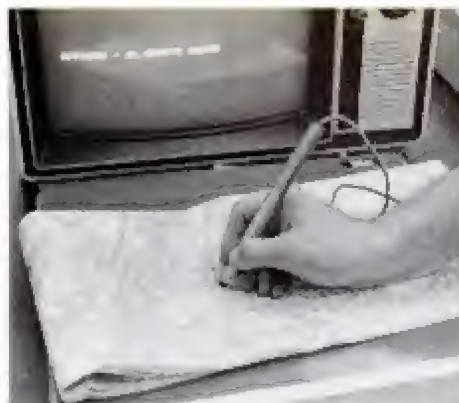
draw in 16 colors in its coarse, low-resolution mode or you can opt for exceedingly fine, high-resolution lines with only six working colors. We found the high-resolution mode to be the best to work with to draw realistic rather than impressionistic designs.

Better than a speeding pen

The Digikitizer also calls upon the power of the computer to aid the artist. You can draw a straight line either by simply drawing it or (if you need a really *straight* one) by just touching the pen to the end points. The Digikitizer allows the computer to automatically connect the dots. This feature really speeds things up and makes for neater results.

But what is truly amazing is the feature of Computer Assisted Design (CAD). Here is something that,

(Please turn to page 170)



Figuring out mileage for a trip is simple using the Digikitizer. Just place map on top of tablet and trace over your route with the transducer pen. You get a distance read-out. Areas are also calculated.



Drawing in high-resolution mode can be done in two ways: Car (above) was made from computer-connected dots, since straight lines were needed. Portrait (below) was done freehand for curves and detail.



Computer-assisted design program allows you to literally "pick up" symbols from bottom row and transfer them onto screen. The symbols can be rotated before being placed, and if you make a mistake, they can be erased. You can then have computer assistance in drawing the connecting lines.



1980 DATSUN KING CAB— THE ROOMIEST SMALL TRUCK IN HISTORY.

A DATSUN EXCLUSIVE! 2 REAR JUMP SEATS INSIDE THE CAB.

It took Datsun to come up with the biggest small pickup news in 20 years: the new Datsun King Cab® GL. With more space, legroom and luxury than you may experience in any small truck—including two reclining bucket seats up front and two jump seats behind that fold up to create more inside storage space than ever. That's "Grand Luxury" as only the King Cab GL can deliver it. With everything from cut-pile carpeting to a road-smoothing new ride.

GONNA PICK YOU UP LIKE NEVER BEFORE.

When you add up the standards, no truck's gonna pick you up like the new King Cab GL. Check out this check list: • Styled wheels • Radial tires • Quad rectangular headlamps • Engine compartment lamp • 5-speed over-drive • Full instrumentation including tachometer • Quartz clock • AM/FM radio • Electric rear-window defroster • Center console • Even a dome lamp that swings down to light the cargo area.



DATSUN MILEAGE. MONEY IN THE BANK.
There isn't a bigger rig that can match Datsun pickups for economy. Yet Datsun trucks, with their gutsy 2-liter overhead cam engines, can haul 1400 lbs. of cargo and some bigger pickups. Now that's a truck you can drive all the way to the bank.

25

**EPA ESTIMATED
MPG**

32

**EPA ESTIMATED
HIGHWAY**

EPA estimates for comparisons. Actual mileage may differ, depending on speed, trip length and weather. Actual highway mpg will probably be less than est. California mileage lower.

PERSONAL PICKUPS. THE RIGHT CAB, THE RIGHT BED.

For 1980, Datsun gives you choice like never before. From standard 6-foot beds... to the super-size Datsun long bed with over 7-feet of cargo length. And cabs ranging from Datsun's lowest priced Standard

Li'l Hustler to the luxurious King Cab GL. We're dedicated to building you the right truck for your trucking needs.

THE TOUGH KEEP GETTING TOUGHER.

Over 37 percent of all small trucks on the road today are Datsuns. That's a tough act to follow—but durability is a Datsun tradition built on quality. We test and retest under demanding conditions until every pickup is Datsun-perfect, and ready for a tough life ahead. Datsun trucks; their first job is to last. Test drive the big news in small trucks at your Datsun dealer—the small truck expert.



DATSUN WE ARE DRIVEN



**Latest Smoker Research Just In:
MERIT undisputed victor over leading high tars
in tests comparing taste and tar level.**

Smokers Prefer Merit 3 To 1!

**Smokers find the taste of low tar
MERIT matches that of high tar cigarettes.**

New taste-test results prove it.

Proof: A significant majority of smokers rated MERIT taste as good as—or better than—leading high tar brands. Even cigarettes having twice the tar!

Proof: Of the 95% stating a preference when tar levels were revealed, 3 out of 4 smokers chose the MERIT low tar/good taste combination over high tar leaders.

**MERIT smokers rate low tar
MERIT satisfying taste
alternative to high tar brands.**

New national smoker study results prove it.

Proof: The overwhelming

majority of MERIT smokers polled felt they didn't sacrifice taste in switching from high tar cigarettes.

Proof: 96% of MERIT smokers don't miss former high tar brands.

Proof: 9 out of 10 enjoy smoking as much since switching to MERIT, are glad they switched, and report MERIT is the best tasting low tar they've ever tried!

You've read the results. The conclusion is clearer than ever: MERIT delivers a winning combination of taste and low tar.

A combination that seems to be attracting more and more smokers every day and—more importantly—satisfying them long term.



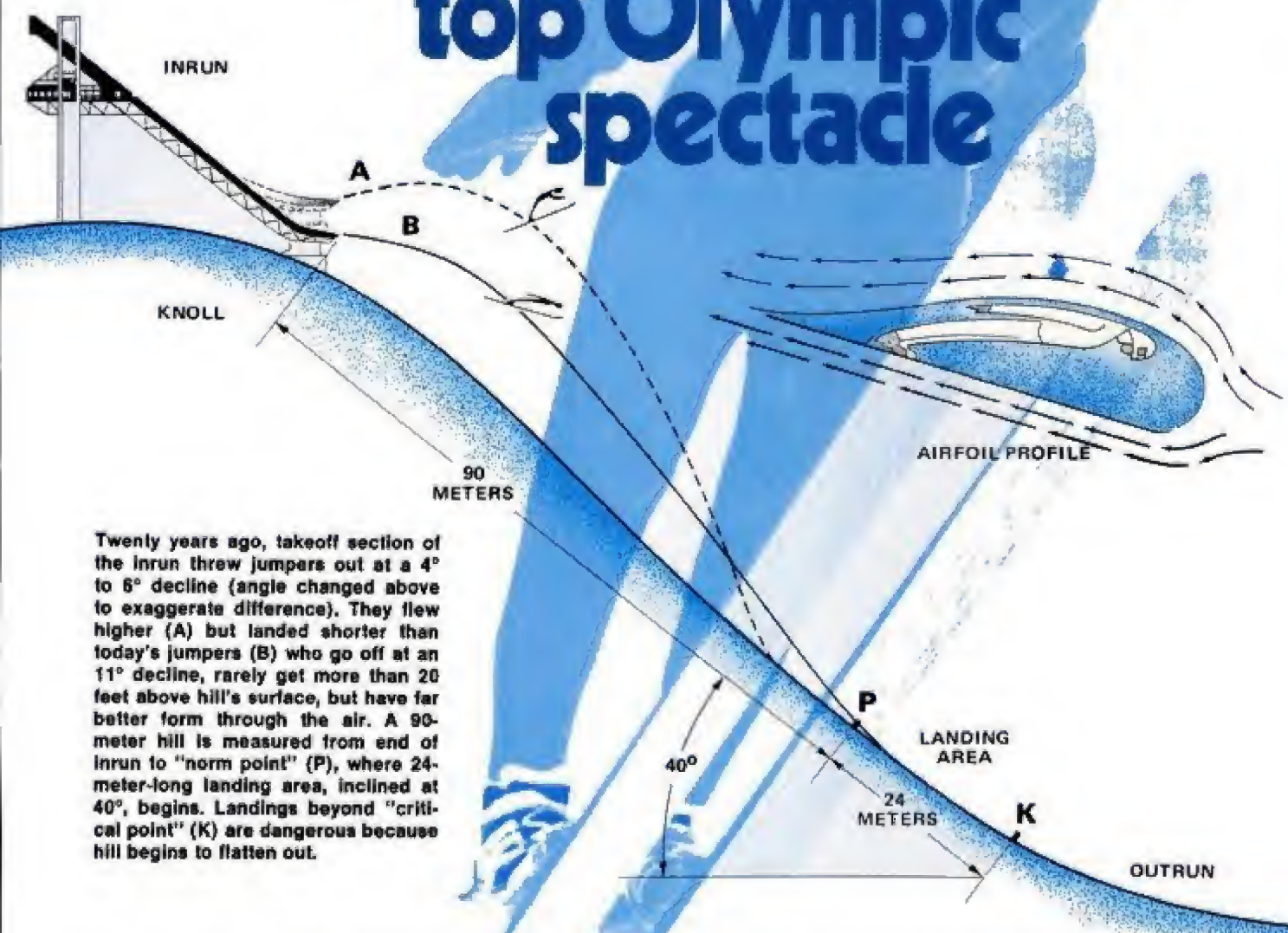
Kings: 8 mg "tar," 0.6 mg nicotine—
100's: 11 mg "tar," 0.7 mg nicotine
av. per cigarette, FTC Report May '78

MERIT
Kings & 100's

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

© Philip Morris Inc. 1979

THE JUMP: Anatomy of the top Olympic spectacle



Twenty years ago, takeoff section of the inrun threw jumpers out at a 4° to 6° decline (angle changed above to exaggerate difference). They flew higher (A) but landed shorter than today's jumpers (B) who go off at an 11° decline, rarely get more than 20 feet above hill's surface, but have far better form through the air. A 90-meter hill is measured from end of inrun to "norm point" (P), where 24-meter-long landing area, inclined at 40°, begins. Landings beyond "critical point" (K) are dangerous because hill begins to flatten out.

It's still the biggest winter thrill, but a lot of needless risk has been engineered out of modern ski jumping.

by Charles Leehrsen

Before the 1980 Winter Olympics are through, a crowd of 18,000—the largest for any of the Lake Placid events and maximum allowable by law—will have gathered in the sub-freezing cold, twice, to gaze with awe

upon one of America's least-played sports. In fact, were it not for the luge and biathlon, both of which have a drawing power that extends to their competitors' next of kin, Lake Placid's hottest ticket—the ski jump—would be the most exclusive event, from a participant's standpoint, of them all.

The fact of the matter is this: In all of the United States there are only about 50 men capable of handling a 90-meter hill, larger of the two Olympic jumps, with a reasonable degree

of competence. That is not to say that more Americans—maybe 150—won't *try* hills that big and bigger, up to 120 meters, but many of them will be ill-prepared. Perhaps 10 men form America's pool of potential world-class jumpers, and no women have ever qualified—not even for the tamer 70-meter hill.

Yet another unusual aspect of ski jumping rests solely with spectators. It's an appetite that yearns for total lapses of form—aerodynamic atroc-

(Please turn to page 94)

A HUMAN



One-piece stretch-fabric suit is skin-tight; porosity must be uniform throughout fabric to preclude "parachute" effect (not permitted in Olympics).

Angle of attack: Jumper finds attitude to give lift-aided descent of about 40° . Too high an angle, he stalls and falls short, too shallow, he's in a dangerous dive.

Skis can be held up to six inches apart before air begins to flow between them. Slight spread increases "wing" area. Typical jumping ski is 8.5 feet long, of reinforced plastic construction with wood or composition core. Deep grooves are for straight tracking.

FLYING MACHINE



Jumpers say they try to "attack the hill" or "ride the air pressure." Either way, borrowing a phrase from another sport, it means trying to lead with your chin. The modern jumper tries to close the gap between his body and his skis, at the same time letting his upper profile curve enough to provide the cambered top surface that approximates an airfoil (wing) shape to give him added lift. With up to about six inches between them, the skis form a solid lower surface with little air flowing through the gap. Perfectly configured, a jumper could maintain his lift-assisted glide indefinitely. Shaping the hill so that he "runs out of it" safely is the job of the engineers.

Modern stress on streamlining exemplified by thumb-straps for sleeves. One hand deflected into airstream gives slight directional correction with differential braking effect.

At takeoff on the 90-meter hill (below), a jumper is hitting about 60 mph, will pick up an added 10 mph or more during the flight. Infinitely adjustable starting gate on Lake Placid's 90-meter jump will maintain long jumps while keeping competitors from dangerously "outjumping" the hill.

Bindings must permit extreme lean, allow skis to "work" in gusts and turbulence.

Built-up heels on ski boots help keep jumpers from "sitting back" on the inrun, getting air under his skis too soon.

Jarvis



ties that will result in a reprise of the "agony of defeat" sequence from *Wide World of Sports*. "Television continually stresses the falls, and some of us don't like that," says Stan DuRose, head of the U.S. Ski Assn.'s Ski Hill Engineering Committee. "Each time we complain, though, we're told that is what the public wants."

Are we all sadists? Well, if we are, we're not every good at it. In fact, waiting for a spectacular ski-jumping spill these days can be a form of masochism, like searching for a good five-cent cigar. The sport has undergone a revolution, and you just don't get the wonderful wrecks that you used to. *Wide World's* famous fall—ultimately harmless, by the way—is nine years old. And the days when skiers "stalled out" 75 feet above the snow are gone forever.

'Riding' the air

Two things have happened. In the first place, ski jumpers have learned to fly. "It is not at all like in the old days," says Karl Martitsch, the architect who designed both of the Lake Placid jumps. "Skiers don't try to push the air or cut the air. Now, the object is to *ride* the air. In theory, if the hill kept going, they would never have to come down."

But—and this is the second break-

through—the hills do not keep going. Rather, they begin, end and undulate in exactly the right places. And they follow the flight curve so snugly that today's jumpers are never more than 15 or 20 feet off the ground, TV camera angles to the contrary. Thus, if an athlete fails to get "up on the air pressure," as they say, he doesn't have too far to fall. And if he succeeds in becoming the perfectly cambered airfoil, the jumper can fly 500 feet at 70 mph and land as softly as if he had hopped off a table.

"All this scientific stuff has made the sport absolutely safe," says Art Devlin, a former Olympian who competed in an era when the hip flask was some jumpers' best friend. "Not as spectacular, but safe." Indeed, several experts contend that, with all the improvements, jumping has become less hazardous than downhill skiing.

Devlin says he began hearing the "scientific stuff" in the early 50s, shortly after the first ski-flying hill was constructed in Oberstdorf, Germany. (Ski flying, a non-Olympic sport, is the name given to jumping from hills of 120 meters or more.) Built by the legendary jumper Heini Klopfer, with considerable help from the U.S. Army Corps of Engineers, the Oberstdorf hill had a "norm point" (expected jumping distance) of 120 meters. It attracted scores of

jumpers from around the world—many of whom skulked home in embarrassment.

The huge jump magnified everyone's faults. "Things you could get away with on a small hill, you couldn't get away with there," Devlin recalls. "You could just *feel* what was wrong. It was great, though, because instead of blindly following the Norwegians, as we had for years, we began thinking, 'Hey, maybe there's a better way to do this.' And with the help of wind tunnels, we found out there was."

Technique evolves

From the time ski jumping became organized, around 1860, until the mid 1950s, the sport's first commandment was "Jump high." Hills were designed accordingly. "The old inruns threw you straight up into the air," says Devlin. "From the top, they looked like a crazy loop-the-loop."

Actually, the upward tilt of the takeoff point was an illusion, created, most likely, by the fact that a steep (usually 38°) stretch of inrun lay between it and the skier. At its end, the ramp was much flatter, but if you viewed the hill from the side, it was obvious that the takeoff point did in fact go *downward*, if only 4 to 6°.

Using their well-developed thigh muscles, old-time jumpers would push off this slight incline for all they were worth. Add the element of a "knoll" area that dropped off sharply and you've got a jumper who was far off the ground. Devlin has an old photo-

With adjustable starting gates, variable decline takeoff sections and contours that exactly follow a jumper's correct flight path, Lake Placid's 90- and 70-meter hills cost \$6.5 million to tilt out.





Arm-waving jumper at 1905 Michigan event shows form that dominated sport's early years.

graph of himself—near the entrance of his Olympic Motor Inn, on Lake Placid's Main Street—in which he is 100 feet above planet Earth.

He considered the 30-year-old picture recently and was not pleased. "Arm's kind of cockeyed," he said.

A large, brightly lit trophy case has been built into one wall of the Olympic's lobby. Behind glass, little gold men dot the rugged landscape. The display is impressive—whole high schools have not reaped as much hardware as Devlin—yet it is slightly funny, too, for the tarnished skiers seem to be falling from their pedestals. Their legs are straight, their backs are straight, but they are bent

dangerously at the waist. If a little gold Olympic judge were to wander by, he would not be pleased to find them in the obsolete jackknife position.

In its time, the jackknife was a serviceable technique. By opening and closing their L shape, jumpers compensated for poorly designed inruns that sent them off too fast, or in an unnatural attitude. Before the engineers took over, improvising was the name of the game, as well as the downfall, quite literally, of skiers prone to panicky overadjustments. Remember the newsreels of jumpers who flapped their arms like birds? Those guys were searching desper-

ately for what aviators call the "angle of attack."

The 70- and 90-meter jumps at Placid's Intervale area, rebuilt for these Olympics at a cost of \$6.5 million, are probably the best in the world. Both have takeoff points that drop between 9 and 11°, depending on the snow cover. At that steepness, and with the new style of jumping, Olympians are virtually assured of falling into an aerodynamically correct posture.

Modern skiers begin their jump in a crouch called the egg position. On the way down the inrun, they keep their legs apart, so that air can pass through, and they can gain speed. If a man goes too fast, however, he can "out-jump" a hill, and wind up past the K (critical) point. On a 90-meter hill, the designated landing area, which stretches from P, the engineers' symbol for the norm point, to K, consists of a 24-meter stretch that drops at 40°. Between the takeoff point and P is what is called the knoll; the measurement of this expanse equals the official size of the hill. Beyond K, the hill becomes too flat, and is considered dangerous for landing.

To find out if a jump is running too fast, judges send down a number of noncompeting skiers known as forerunners. These brave souls are timed electronically at the 38° section of the inrun, where, ideally, they should be traveling between 56 and 58 mph. At that rate, they would

(Please turn to page 140)

Welcome to Placid—would you like to see a venue?

For months now, Lake Placid, N.Y., has been festooned with banners that say "Welcome World, We're Ready." The 3000 residents of that Adirondack Mountain community take their Olympics seriously, and it is easy to see why. The 1932 games put Placid on the map.

In sharp contrast to the economy, the weather in 1932 was rather warm. Since there are no Olympic events involving slush, this caused problems. But no more. In 1980, everything that can be refrigerated will be, and there are machines standing by that can cover the entire downhill course of Whiteface Mountain with 16 inches of snow in 16 hours. In all, more than \$92 million in Federal and state funds have been spent to build housing and refurbish Olympic venues. Here are some of the high-points:

Bobrun: Some safety modifica-

tions have been made on this 1557-meter course since 1932, but according to Erich Scharer, a Swiss sledder, its strong point is that it is still not perfect. "We don't like 'computerized' runs," he says. "They present no challenge." The Placid bobsled run has 16 curves, many of which will be taken at around 90 mph.

Luge Run: Once, during a Washington hearing, a U.S. Congressman asked if luge wasn't "something to eat." It is not. Sleds are light and extremely dangerous, since they travel, sans steering mechanisms, at 70 mph. The 1000-meter course in Placid is the only luge run in the Western hemisphere.

Speed Skating Oval: Located on the campus of Lake Placid High School, which will be closed during the games, the speed rink measures 400 meters. The price for refrigerating it was \$3 million—or about

three times the cost of the entire 1932 Winter Olympics.

Fieldhouse: The arena built 48 years ago is still in good shape, and it will be used this year, but it seats only 1200. The new \$16 million structure, right next door, houses 8500 spectators and two ice sheets.

Whiteface Mountain: In addition to the previously mentioned snowmaking equipment, a 6400-foot quad chair lift has been added to what will soon be rechristened Olympic Mountain. On the bottom, by games' time, will be a new lodge for 4000.

Olympic Village: Housing for 1800 athletes and officials has been built in the hamlet of Ray Brook, five miles from downtown Lake Placid. For security reasons, visitors will not be let in. Someday, no one will be allowed out, because after the Olympics the compound will become a Federal prison.—C.L.

Mobile operating room



An inflatable tent system for medical use on the battlefield or in civil emergencies has been developed by a Swedish firm. The Field Medical Tent 80, made by Trelleborg AB, provides a spacious, light and sterile environment for surgery and/or recovery. Each module comprises four air-filled arches spaced by aluminum tubes and measures about 17 by 24 feet. The highly mobile unit goes up and dismantles quickly. At 400 pounds, it is easily carried by four to six men. Tent is said to offer more usable floor space and better hygiene than other designs.

Who needs snow?

Winter may seem to last an eternity, but it never lasts long enough for ski-lift operators. To earn money when there's no snow, some Bavarian slopes offer rides on a Sloper, a four-wheeled, highly maneuverable vehicle powered only by gravity. Slopers can hook up to a ski lift and unhook with the push of a button. Steering is accomplished with foot pedals, and the handlebars pull toward the driver for braking. Both the foam wheels and braking plate are said not to harm turf. To avoid multivehicle collisions, only one goes down at a time.



No more roar

Intended to compete with helicopters for use in seismic surveys, the 23-foot Tiger air-cushion craft operates much more quietly than most other hoverers. Its four-

blade propeller, which pushes and steers the craft, is housed in a specially designed duct to reduce noise. Because it is quieter, Tiger is also well suited for coast-

al and estuary survey work near wildlife. The 12-seater has a top speed of about 35 knots. It's said to cost one-tenth as much as helicopter used for same work.



Spider for safety

One look at Buchegg Square in Zurich, Switzerland, tells you it's a dangerous place for a pedestrian. But since the in-

stallation of an overhead walkway dubbed the Spider, pedestrian accidents have been reduced to zero. In fact,

there's a stiff fine for crossing at ground level. Another benefit: Pedestrians using Spider are exposed to less auto exhaust.



Yakety-yak

The Yak Yeoman was designed to go anywhere and be cheap and easy to build. Its chassis is made of welded rectangular tube; the two side panels are the same, as are the four fenders. A limited-slip differential applies power to one rear wheel if the other starts spinning. Two

power takeoffs can be used to operate other equipment or haul the Yak out of a jam. It's available as a covered wagon, pickup truck or personnel carrier. The maker, Manchester Garages Ltd. in England, claims the Yak can be assembled by two workers in under a day.



Cordless phone



Like to move around the room when you talk? A cordless phone made by the German firm Siemens allows just that. Unlike models using radio frequencies, this unit employs infrared light. The portable receiver houses all controls while the rest of the works are mounted on a wall. Because of signal reflection, system can operate from any corner of the room, but will not interfere with other units in other rooms. Unit is still under development and is not yet commercially available.

FIRSTHAND REPORT

by Gary Witzenburg
DETROIT AUTO EDITOR



Driving the 1980 VWs

Now that Volkswagen of America has been cranking out Rabbits in Pennsylvania for nigh onto a couple of years, the U.S. engineering team, under vice president and director of engineering Duane Miller, has designed its first new vehicle . . . or, more accurately, two-thirds of a new vehicle. From the front bumper to the cab's rear wall, and except for unique front suspension struts, spring and shock rates, the new pickup is basi-

cally standard Rabbit. But from the cab back, it's all new.

Miller calls his group "the smallest major automotive engineering team in the country," and for that reason the initial design was done in conjunction with Sheller Globe engineers in Lima, Ohio. "But," he's quick to add, "we're also the most aggressive."

The bed is a full six feet long and has double-wall construction, so any

(Please turn to page 158)

Truckin' with Volkswagen

Front-wheel drive with either gas engine or diesel, Rabbit pickup is seen from various angles, below left. Payload is just over 1100 pounds, bed length is six feet.

Vanagon retains air-cooled rear-engine, rear-wheel-drive powertrain of original VW bus. Handling is greatly improved, though, as is rear cargo capacity.






Convertible has glass rear window (inset) with electric defogger. Padded top folds down easily, doesn't take up cargo space.



THE

A large, colorful striped hot air balloon is the central focus of the image. It features vertical stripes in shades of red, blue, yellow, and brown. The balloon is inflated and floating over a green, grassy field. At the bottom of the balloon, a basket is visible with several people inside. The background shows a clear sky and some distant structures on the horizon.

With no experience either in flying or constructing balloons, two East German families collaborated to put together a successful escape vehicle of spectacular size. The test flight was also operational.

FREEDOM BALLOON

They worked secretly, by night, in constant fear of discovery. But in only 18 months these two self-taught aeronauts fashioned Europe's largest hot-air balloon and soared, with their families, high over their captive society's walls to an epic escape.

by John Dornberg

At 2:40 a.m. on an autumn Sunday morning, the West German town of Naila, population 7000, six miles from the East German border in Upper Franconia, was darker and quieter than a cemetery. All taverns and inns were shut, and the tourists, who stream in at that time of year to see the turning foliage of the idyllic Frankenwald, had long had their last beers and sausages and were slumbering in their featherbeds. Though it was the harvest season, dawn was more than three hours off and even the farmers were still asleep.

For Constables Walter Hamann and Rudolf Gölkel of the Bavarian State Police, cruising the country roads outside of town in their Audi "Foxbat" patrol car, it had been a routine night—except for a case of multiple hit-and-run driving which occurred shortly after they had begun their patrol duty.

Suddenly they spotted a strange light flickering and moving slowly in the starry, quarter-moonlit sky.

A meteor? Too slow and it wouldn't be visible that long. A UFO? Gölkel and Hamann laugh: "We don't believe in them." The two observed the light from the ground for a few more minutes, estimating that it was at an altitude of over 5,000 feet, then saw it mysteriously extinguished. But they were certain it was some kind of object coming down—fast—about two miles southwest of Naila. When they reached the estimated place they could see nothing at first. But suddenly two men—Peter Strelzyk, 37, and Günter Wetzel, 24, appeared like apparitions out of the dark, bursting through the bushes.

"Where are we?" they asked apprehensively in the accent of their native Thuringia, just across the border. "Are we in the West?"

Yes, the constables assured them. Strelzyk and Wetzel whooped with joy, then called out to their wives, Doris Strelzyk, 34, Petra Wetzel, 23, and their four children, aged 2 to 15, still hiding in a nearby shed: "Come out, we made it! And bring that champagne bottle. We can open it now. That's what the books said all balloonists do when they land."

Günter Wetzel's broken leg was only casualty of balloon's hard landing. It kept the hospitalized Wetzel (above, right) from joining a re-enactment take-off (below), in which Peter Strelzyk, his wife Doris (kneeling at left), Petra Wetzel and children of the two families packed the home-built "gondola" for a photo.



"A balloon?" Gölkel and Hamann, not entirely unaccustomed to encountering airborne defectors from East Germany, asked incredulously: "You came in a balloon?"

"Hot air. We built it ourselves," Strelzyk said proudly. "Come look, it's in a clearing back there."

Thus ended the most ingenious, courageous and bizarre escape ever made across the grim, tightly patrolled frontier between the two Germanys.

Communist East Germany was created out of what had been the Soviet zone of the occupied Nazi Reich after World War II and Hitler's defeat. It celebrated its 30th anniversary as a sovereign state, recognized by the United States and 120 other nations, just three weeks after the Strelzyks and Wetzels landed near Naila. Whatever else it may be, it has the dubious distinction of becoming the only country in world history that has ever built a wall to keep people in, rather than out.

Its 836-mile-long frontier with West Germany, plus the 28 miles that divide East from West Berlin, located like an island 110 miles inside East German territory, bristles with watchtowers, barbed wire and mesh fences, self-triggering shrapnel guns, land mines, vicious dogs, plowed strips, vehicle traps, searchlights and 60,000 machine-gun-toting soldiers (see facing page).

The border, fortified in this manner in 1961 in an attempt to halt the postwar hemorrhage of refugees from communism, and still being tightened and worked on every day, is a tragic symbol of authoritarian rule and of man's inhumanity to man. But it is also a tribute to his valor, fortitude and inventiveness, for despite the manner in which it has been systemically sealed, some 80,000 East Germans have managed to get over, under and around it during the past 18 years.

But not usually in homemade hot-air balloons—and at that, the biggest one ever built or flown anywhere in Europe, according to West German experts. That taxes the imagination even of those familiar with all the imaginative capers (see facing page) which have been pulled to travel illegally from East to West.

Even in an affluent, free country, it would be quite an achievement to build your own balloon with no previous experience or instruction, particularly one large enough to safely transport four adults, one nearly grown teenager and three smaller children. But it is hardly an imaginable undertaking in an economically mismanaged police state where the materials are barely available, must be bought and gathered surreptitiously, and all the work must be done in total secrecy at the risk of long imprisonment. And to fly it without testing? Almost madness!

Only two men with the gumption, guile, technical skills and sheer courage of Peter Strelzyk and Günter Wetzels could have done it.

Why and how they did it

In an interview in Naila, only 35 miles south, but a political and ideological world removed from their erstwhile homes in Pösneck, East Germany, they told me why and how they did it.

They have been close friends since they met four years ago while both were scouring stores in search for one of the necessities usually in short supply in a com-

munist country—bathtubs and some bathroom fixtures.

Each had recently bought an old house and was remodeling it. Both were technically educated and incorrigible tinkers, eager to solve mechanical problems.

Wetzel had wanted to be an automotive mechanic but could apprentice only as a bricklayer. The last few years, when not moonlighting as a repairman and electrician in partnership with Strelzyk, he drove a truck for a "people's-owned" transport enterprise.

Strelzyk, who apprenticed as a machine fitter, had hoped to become a pilot when drafted into the East German air force in 1963, but he served, instead, as an aircraft mechanic. After his discharge he trained as an electrician, then, with three skills to his credit, went to work for Pösneck's "people's-owned" plastics and synthetic fiber factory. There he rose quickly to become a foreman and then a department head in charge of automation control technology. By the time he quit three

years ago, to become a self-employed electrician—small craft shops being allowed in East Germany—he was earning well above the average and had collected 50,000 East German marks (\$7500) as premiums for suggestions he had made to improve production at the plant.

By East German standards the Strelzyks and Wetzels, with both wives also working, were well off. But both families

wanted out of what they describe as a "hermetically sealed workers' and farmers' republic."

"It wasn't the higher living standard in the West that appealed to us," Strelzyk explains, "but the hypocrisy of the whole system in the East that repelled us."

"You are subjected to constant propaganda and lying. You are not free to read what you please, to say what you think, or to travel anywhere except to other communist countries, and not always that. Worst of all, it turns your children into opportunists and hypocrites."

The idea takes shape

Thus began talk of fleeing. Surface routes were immediately ruled out as impenetrable and too dangerous. Somehow flying over appealed to both men, and for a while they toyed with the notion of building a helicopter, only to rule it out when they realized they would not find a powerful enough motor to lift eight people.

Then, one evening in March 1978, one or the other—they do not remember who—said: "Why don't we build a balloon?" The idea seemed so great that they headed to Pösneck's only bookshop and the library the following morning and began reading all they could find even vaguely connected with the subject.

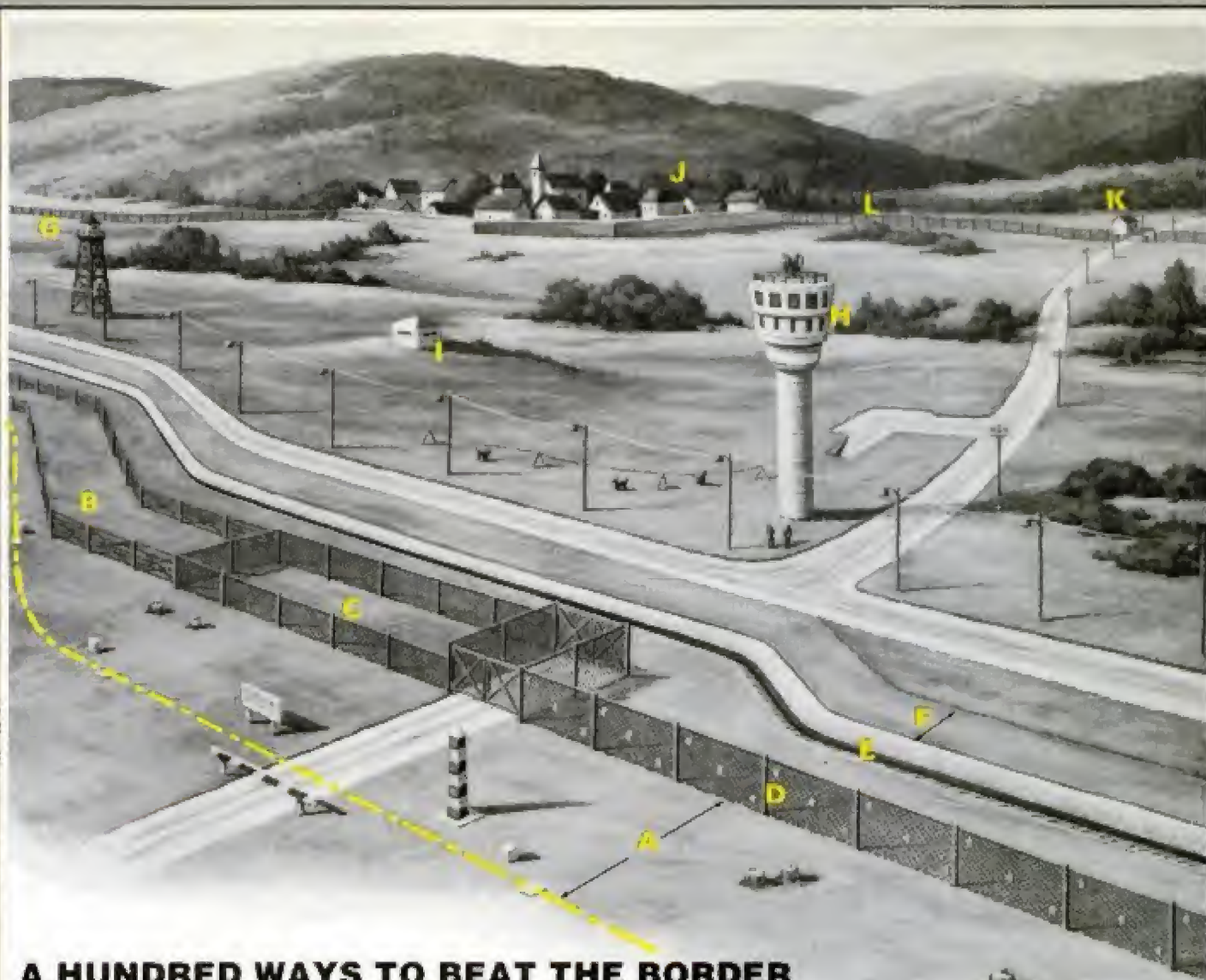
What they soon learned from their reading was that they would need a huge balloon. Four adults, Strelzyk's son Frank, the three smaller children, the gondola, the gas containers, the burner and the bag itself would probably total 1650 pounds.

Using the isobaric equation of state for air, they calculated they would need a balloon with a volume of 70,629 cu. ft., provided they could raise that much cold air from around 32° F to a temperature of 212° F. They figured the balloon would require at least 8,611 sq. ft. of material.

Two days after first thinking about it, they went out

(Please turn to page 146)

We opened the bottle of champagne first. That's what all the books say balloonists do after they land.



A HUNDRED WAYS TO BEAT THE BORDER

Anyone with a strong desire to leave East Germany is standing at the end of a long, long line. Successful emigres have used just about every means except rockets.

Those who did not succeed were either shot and killed in the attempt—169 since 1961—or were imprisoned for up to 10 years for the unique crime of "trying to flee the Republic."

Many have tunneled, and some have scuba-dived, under the border. One man, in 1968, built a mini-submarine that conveyed him, at 3 mph, from the East to the West German coast along the Baltic Sea. Others have rowed that route in rafts and dinghies, and one woman swam it—over 40 grueling hours.

Over the years, several dozens—a few not even trained as pilots—have used small planes to fly over it, and in 1962 an entire family, using helpers on the other side, crossed the Berlin Wall from one building to another on a tightrope cable with a roller and suspended sling seat.

East Germans are often smuggled out aboard the trucks traveling on the East-West transit routes. They jump their country's ships in neutral harbors or off friendly shores. They take advantage of the more relaxed rules in some other socialist countries, such as Yugoslavia, to escape while on "vacation" (although loved ones are often left behind, since the government discourages entire families from vacationing together—for obvious reasons).

Some have simply rammed through border fortifications with armor-plated trucks, buses and cars. And every year several dozens—no one really knows how—continue to make it across the mine-fields, past the tripwires and shrapnel guns, watchtowers and guards, through and over the fences on foot. Every land conveyance known to man has been used, from a tiny Isetta, rebuilt to hide one person under the seat, to a Cadillac, remodeled by a professional escape organization to stow one escapee between dashboard and firewall.

The "gentlemanly" way, though by no means less risky, has been

In an area typical of that where the Strelzyk-Wetzels balloon crossed, the actual East German border (red line) is backed by an astounding security array. Beyond the stone markers and demarcation signs is a space (A) up to 100 meters wide, cleared of trees and shrubs. The common double row of barbed wire fence (B) with land mines between is currently being replaced, either by a double row of wire-mesh fencing (C) and mined strip, or by single wire-mesh fence (D) 10 feet high with tripwire and remotely triggered shrapnel guns mounted at leg, midsection and head levels. Beyond fencing is a concrete trench (E) to trap vehicles attempting to ram their way out. Beyond that, a plowed security strip (F) 40 feet wide picks up all footprints. Back from the service and patrol road are old-style wooden guard towers (G), newer concrete tower command posts (H) and observation bunkers (I), plus leashed dogs on long wire runs. Even nearby villages (J) have their 10-foot-high walls and the border crossing checkpoint (K), up to three miles from the border, lies along a rear security line (L) with electronic, acoustical and tripwire sensing devices. On its first, unsuccessful balloon attempt, the Strelzyk family actually flew into this area and landed only yards from the "death zone."

to simply outwit the border guards with passport flim-flams, fake documents or a straight face.

Thus, in the mid-1960s, some 180 East Germans were spirited out disguised as foreign diplomats, riding in long, black limousines from a car-rental agency, and displaying impressive-looking, leather-covered documents, originally printed as membership cards in a fancy West Germany Playboy-type club called "Confederation Diplomatique." The initials "CD," embossed on the cards, were misread by East German frontier guards as diplomatic passports.

(Please turn to page 150)

Big-screen TV turns a living room into a private theater. We used a videodisc system along with this two-piece Advent Model 761 projection TV (screen in background, console in foreground). You never have to worry about being entertained if you own such a system. With pre-recorded film or live TV, the giant screen brings the picture alive!



ADVENT 761

Get the **BIG PICTURE:** Pick of the projection TVs

PM photos: Frank Lusk



Here are the best of today's projection TVs and a look at what tomorrow may offer. Only question left is—do you have a big enough living room?

by Stan Prentiss

Projection televisions are more appealing buys than ever before. Their 50- to 78-inch washable screens often display excellent picture definition and color rendition.

The lenses have been improved for greater brightness, and the receiver itself has undergone improvements, both at the engineering and consumer levels. Engineers can appreciate such features as a comb filter for enhanced horizontal resolution—while the rest of us simply remark on how clear the big picture seems. Then there are features such as

timers, remote control, and the ability to easily plug your own stereo into the set in order to *really* hear the sound.

Some 50,000 sets were sold in 1979—that's \$125 million retail dollars—and by this year's end another 70,000 should be sold to homes and businesses. By 1980 many Americans will have their own home movie theaters and be royally entertained by video fare from broadcast programs, cable TV, video discs and cassette recorder/players.

Meanwhile, here's how to evaluate

(Please turn to page 106)



The Advent 710 (above) is a two-piece set with optics (and price) slightly below that of the same company's Model 761 (left). Panasonic's CT-6000 (right) is a three-tube projection system of excellent quality. Mitsubishi's VS500 (bottom left) offers one of the brightest, true-to-life pictures we saw.



MITSUBISHI VS500



PANASONIC CT-6000



SONY KP5000

Sony's KP5000 is a one-piece set which uses two, rather than three, lenses to project the picture.



The Giant Screen TV
Center of New York,
where all photos were taken, offers two
one-tube systems of their own. The Mark 5
(left) has a glass lens, the Mark 4 (right)
an acrylic one. Both perform well.

the systems now on the market and
compare the technologies they offer.

The systems

Contemporary models sell in one-
or two-piece units, the difference be-
ing that projection screens are either
mounted on the cabinet or are sepa-
rate. All better sets, however, have
three cathode-ray tubes (CRTs) for
red, blue and green colors, and most
operate at 30,000 volts (high voltage)
—approximately the same as any
direct-view 25-inch TV receiver. So,
in this one respect, there's nothing
new. The big differences are in optics,
curved or flat screens, chassis fea-
tures, remote controls, and excellent
red, blue and green picture-tube beam
convergence—without which the pic-
ture cannot be accurately and sharply
defined, causing its resolution to suffer.

In one-piece units, distances be-
tween screen and optics have already
been preset by the manufacturer. The
result is a "compact" roll-around set
whose basic limitation is screen size.
In two-piece systems, the screen is
separate, often larger, and is placed
a carefully measured distance away
from the electronics in the console. Six
to seven feet is about maximum screen
size for home use.

Common optics for most of these
sets are of either the refractive or
Schmidt type. The Schmidt type con-
sists of two in-line mirrors, one with
a center hole so that the light image
may pass through and then be reflected
back and onto a projection screen,
doubling light output. Refractive ar-

rangements have increasingly "fast"
single or dual lenses and are rapidly
challenging the more expensive, usu-
ally precision-ground glass Schmidt
optics for pure brightness—but not
always giving the best contrast or
overall picture sharpness.

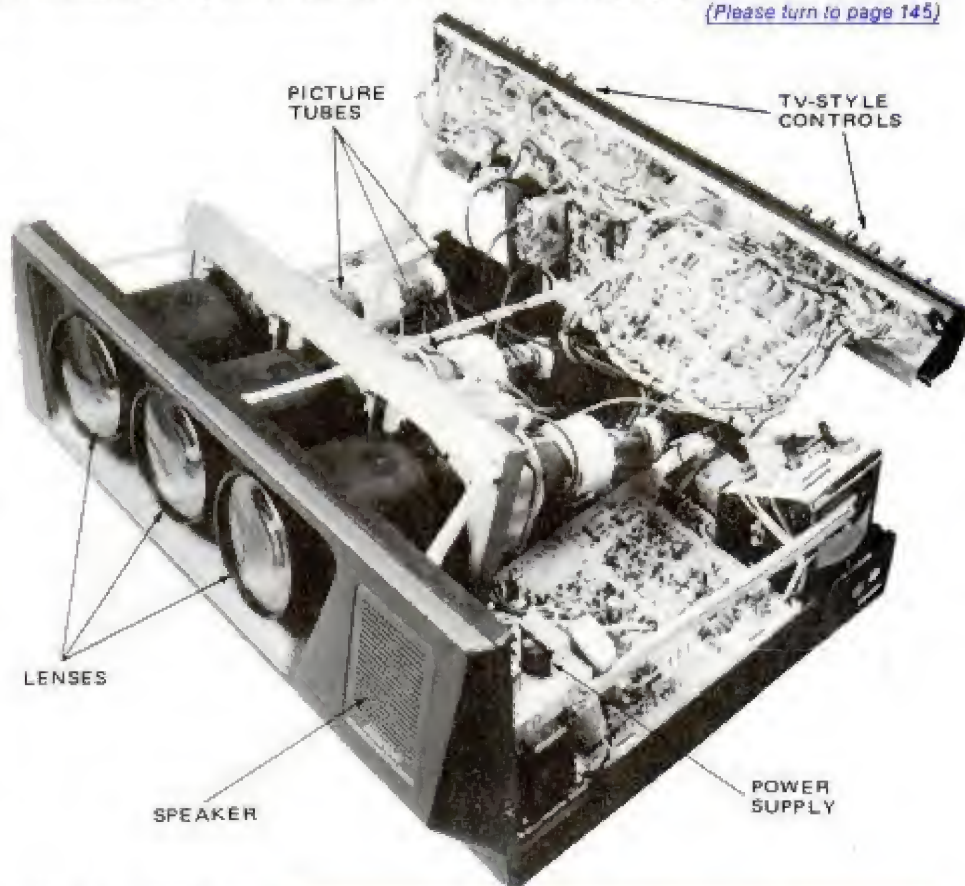
The refraction term comes from the
normal process of "bending" a light
beam through any magnifying lens to

produce an enlarged image. Common
lens speeds for plastic Fresnel discs
are $f/1.5$, followed by $f/1.85$ for
aspheric acrylic and $f/2.4$ for pre-
cision-ground glass—with even faster
 f -stops on the way for better
brightness.

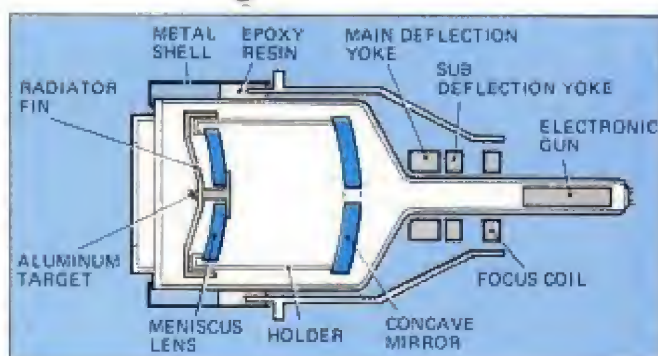
Two-piece projection sets usually
shine red, blue and green beams, with
actual blending of colors occurring on
the screen itself. This is done to pro-
duce pictures with four to five times
the brightness of single-tube systems.
Single-piece sets ordinarily aim their
CRT tubes at a silver-coated mirror
(some front-coated, others rear-
coated), which folds the three light
paths, shortening the distance be-
tween tubes and screen by half and
reducing overall brightness by only a
few percent.

There are also a number of single-
tube, single- or multiple-lens projec-
tion receivers that are ordinarily
much less expensive and produce pic-
tures of lower light level and less defi-
nition, roughly proportional to their

(Please turn to page 145)



Lenses in picture tubes of a projection TV are one-piece units (as shown above and at right). The best systems available use three picture tube/lens arrangements. One assembly projects red, the next blue and the third green. The three projected images are reflected from a mirror (left) and are combined visually on the large projection screen.



Build a giant-screen TV— from kit or scratch

You can now build your own big-screen TV for less than \$500. It will provide you with all the pleasure and satisfaction of giant-screen TV sets that cost up to eight times as much. How? By using the new low-cost TV projection screens and lenses that have recently been developed.

Giant-screen television is not new. It had its beginnings with early black-and-white television. Some early sets used small picture tubes that projected the image through a lens onto a screen, similar to a slide projector. The giant-screen TVs of today use the same principle.

The problem with projection TV has been, and still is, brightness. How do you take an image produced by an ordinary color TV picture tube, project it through a lens to a screen and end up with a picture that is satisfactory for viewing under normal room light?

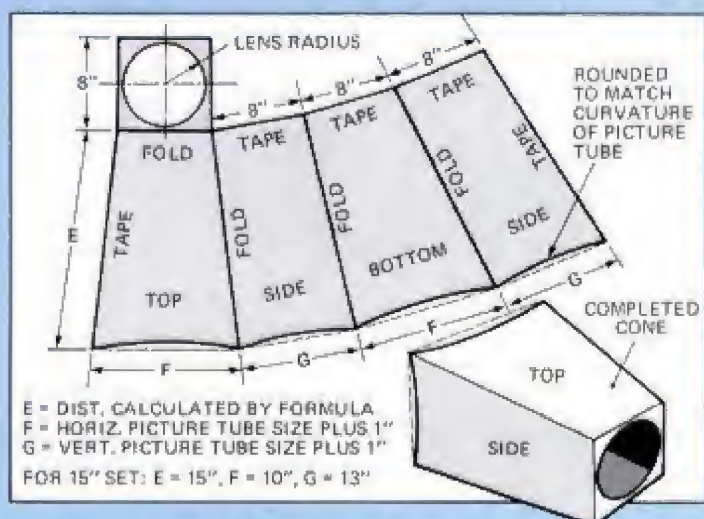
The problem has been a difficult one to solve. Most projection lenses can

Designing and building your own projection TV can be easy and relatively inexpensive. There's even a complete kit available.

by Robert Rupp



Building your own big-screen TV can be as simple as we show here. All you need is a good-quality lens and just enough cabinetry skills to fashion the cone that holds the lens in front of a TV screen. We show you how to figure out the critical dimensions.



Our prototype version uses a cardboard cone to hold the lens; follow cutting guide (above) to fashion your own. Once it's designed, you may want to make one of wood.

transmit only about 4 percent of the light produced by the picture tube. Some companies effectively attacked the problem by using three picture tubes instead of one. Each tube scans its own color—red, green or blue—and projects its own separate image. These images are then perfectly superimposed on a highly reflective screen. This system is capable of producing three times the brightness of a one-tube projection system.

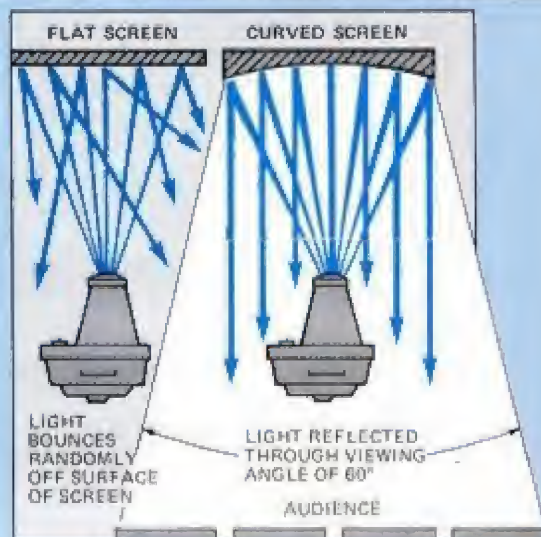
Many low-cost giant-screen TVs use ordinary solid-state portable TV sets

The cone should fit snugly around the TV screen (above). Once made, TV/cone arrangement must be set at correct distance from a concave screen (right).

as the picture source. By using special lenses and screens, they provide an adequate picture. This is the system that the average person can build.

To build your giant-screen TV, you should first know something about how projection lenses work. Normal camera lenses do not work because they cannot "see" enough of the TV picture tube to project it. The new lenses, designed for TV projection, are of the Cooke triplet design, and consist of two positive and one negative lens ele-

(Please turn to page 152)



FIRSTHAND REPORT

by Michael Lamm
WEST COAST EDITOR



Driving the 1980 Honda Civic

Like the Volkswagen Beetle, the Honda Civic set a trend in this country. The Civic legitimized and popularized the smallest car acceptable to the American public.

Before the Civic, the Beetle held that distinction. Several import makers, including Honda, had tried to introduce smaller models here—

smaller than even the Civic. But these proved *too* tiny and failed.

In May 1973, Honda replaced its two-cylinder 600 minicar with the first Civic. The Arab oil embargo followed that December, and Honda dealers immediately found themselves in clover. Honda has since become a household name in motorcars. Before



Civic 1500 DX has simple, handsome styling, with well-integrated bumpers. Note flared wheel arches, which add to sporty look.

All of the controls are easy to reach in Civic's well designed interior.



Redesigned tailgate opens to bumper for loading.



the embargo, Honda's U.S. reputation centered on motorcycles.

Back in '73, the Civic represented Honda's biggest four-wheeled offering. Today it's the most petite. Even so, the Civic has grown slightly for 1980—up two inches in wheelbase, 2.5 inches in overall length, nearly three inches in width, 2.3 and 3.5 inches respectively in front and rear tread. The three-door hatchback has gained 13 percent in interior space, while the Civic wagon's carrying capacity is up 26 percent.

The '80 Civic keeps the same general shape and lines, but you'll notice some welcome changes. The liftgate on the three-door hatchback now dips to bumper level for easier loading. There's more legroom in the rear seat.

The front end borrows from the Prelude—a wide, uninterrupted grille with parking lamps in the bumper. The Civic's taillights are larger and more horizontal than for '79.

Front-wheel drive and transverse engine placement remain. The Civic again comes in two body styles, but this year there are two engine sizes and four models.

Body types are the three-door hatchback and a five-door wagon. Add to that 1300-cc and 1500-cc engines, four- and five-speed manual transmissions, the optional two-speed Hondamatic, and you have the overall picture on Civic choices.

The Civic's price leader lists for \$3699 and consists of the three-door hatchback with four-speed gearbox

and CVCC 1300-cc engine (CVCC stands for Compound Vortex Controlled Combustion—a stratified charge principle that allows all Honda engines to burn extremely lean fuel mixtures). The 1300 still sips regular *leaded* gasoline, but it's the only Honda that does, and it isn't sold in California or in some high-altitude regions.

Climbing the model ladder, all other Civics now use the new 1500-cc ohc Four. There's the plain-Jane Civic 1500, another unadorned hatchback with four-speed only, which costs \$4049.

Then comes the Civic DX three-door, in a 1300-cc, five-speed version for \$4175; with a 1500-cc engine and

(Please turn to page 156)



New 1500 DX, on a dirt road near Green River, Utah, averaged 33 mpg coast-to-coast.

Coast-to-coast in a 1500 DX

From the moment I sat down at the wheel of the new 1980 Civic 1500 DX, I knew this car was no ordinary "econobox." I adjusted the backrest of the comfortable, cloth-insert bucket seat to its most upright position and slid the seat back. There was plenty of legroom.

I adjusted the integrated air conditioner (\$500) and left Los Angeles on route I-15, bound for New York. Seven hours later, I was in Mesquite, Nev., 353 miles away. I had spent those hours driving through the desert, and my road speed averaged 52 mph. Despite crosswinds of up to 40 mph that left many motorists stopped in despair, the car tracked easily, needing few steering corrections.

After a brief stop for dinner, I drove another 200 miles. The seats

were so comfortable that I never felt tired. I quickly became impressed with the Civic's excellent road manners as I piloted the car through twisty mountain passes in Utah. The steering was light and precise, acceleration swift, braking quick.

After driving through some beautiful mountain ranges in Utah and Colorado on the second day of my 2965-mile journey (and tackling some snow-covered highways at elevations of up to 14,000 feet without much difficulty), I reached the flat, wide-open farmlands of Nebraska on day three.

Now that the Civic was broken in fully, it was time to test its performance. The Civic impressed me with its quickness, especially during passing maneuvers. I was able to go

from 30 to 50 mph in a lightning quick 5.2 seconds in second gear. In third, I was able to go from 50 to 70 mph in only 8.7 seconds. And zero to 60 took a reasonable 14.2, although you'll never be able to duplicate this time using the 32- and 53-mph shiftpoints that are marked on the car's speedometer—they lie beyond the 1488-cc engine's 5000-rpm power peak.

The Civic turned in remarkable fuel economy. For example, on a 606-mile run between North Platte, Neb., and Geneseo, Ill. (with a third night stopover in Des Moines), the car got 39.77 mpg at an average speed of 61 mph.

Not only is the Civic comfortable, but it seems much larger from the driver's vantage point than its diminutive 148-inch length would suggest from the outside. Clever interior design certainly helps to make the car seem spacious: The windows are relatively large (especially the tall windshield) and the dash is set well back toward the firewall.

The test car did have a few flaws, the most noticeable being too many squeaks from various trim panels as the car traversed bumps (the ride, incidentally, was busy but not punishing). The defroster could not be shut off when the ventilation system was set in the "heat" mode, and it filled the upper areas of the interior with cold air at night. Finally, the backrest adjuster on the seat has click stops that are too far apart for fine tuning.

Other than these few quirks, the Civic was so much fun to drive that it could easily put many \$10,000 GT cars to shame. Its overall 33.3-mpg average fuel economy was respectable. I think I'll order mine in silver with a red interior. —*Moss Miller*

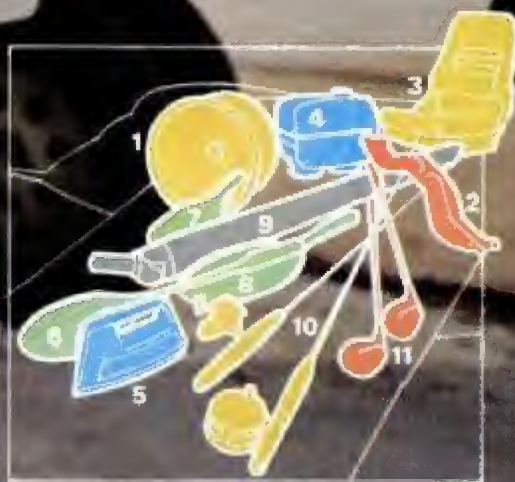
Plastic gets

Modern lightweight composites are challenging steel and aluminum in applications from house walls to fighter wings.

by Robert L. Perry



tough



On composite wing of McDonnell Douglas AV-8B: 1 auto wheel; 2 transmission support; 3 Corvette seat; 4 Maxim oven; 5 Hamilton Beach iron; 6, 7, 8 rackets; 9 driveshaft; 10 fishing rods; 11 clubs. (Composites 1-3, PPG Industries; 4-5, General Electric; 6-11, Celanese Corp.)

Deep in a basement room of what used to be a New Jersey high school, a technician engages a groaning, puffing machine that looks like a dry cleaner's steam press. The "press" rolls a brown, silky material into a tough but willowy fishing rod. Another technician nearby toils on what looks like a miniature carpet loom. He is winding an automobile driveshaft that weighs half as much as one made of steel. One major difference between this driveshaft and metal models: It's twice as strong as steel.

Both men at the Celanese Chemical Corp. research center in Summit, N.J., are testing supercomposites—modern materials similar to stuff in acrylic sweaters and polyester pantsuits, but chemically more complex. These new materials may cause a revolution in the auto industry as great as the one from wood to steel 50 years ago. And their potential for you and me may be as significant as the move from the Stone Age to the Bronze Age. Ancient man combined soft copper and brittle tin to make durable bronze; modern man mixes miracle materials, such as carbon fiber and plastics, to make strong composites. The challenge to traditional materials from tough, new composites has sent engineers for aluminum and steel companies scurrying to their calculators.

Man-made materials have come a long way from the nylon stocking and cheap plastic whistle. Today, advanced forms of nylon, for instance, are showing up in the strangest places: around the chests of police officers, for instance.

Bettendorf, Iowa, police officer David Schafer was wearing a lightweight vest of Kevlar, a Du Pont-made material similar to nylon, when he trapped a robbery suspect in a drugstore. The suspect tried to shoot his way out of the store, charging at Schafer and firing a .45 automatic. One of the slugs slammed into Schafer's stomach from less than a foot away. The Kevlar, a fiber five times as strong as steel pound for pound, stopped the slug. The suspect was fatally shot by another officer after a short chase. Schafer's only injury was a bruise. Without the Kevlar, he almost certainly would have died.

The common link among all plastics is a chemical building block called a polymer. A polymer is a repeated string of carbon, hydrogen and nitrogen molecules. How chemists arrange the string at different temperatures determines each polymer's properties.

The first polymers were short strings that make the most widely known plastics—common nylon, acetate and rayon. Many of today's longer polymers were "fallout" from other research. Robert Edelman, Celanese senior research chemist, says that carbon fiber, one of the major composite discoveries, was developed as British researchers sought stronger, lighter materials for jet aircraft bodies.

Carbon fiber masquerades under other names—graphite or graphite fiber. But they're the same thing—practically pure carbon produced in intensely hot, complex chemical reactions.

The frustrating road to fiber

Like many advances in modern technology, the development of graphite fiber proceeded in small, sometimes frustrating steps. "To make carbon fiber, they first tried burning cellulose (as in cotton) and rayon (as in stockings). But cotton incinerated and rayon melted into a mess," Dr. Edelman says.

After trying many other materials, researchers found that burning the polymer polyacrylonitrile (PAN) at 2700° F. drove off every atom but carbon. Combustion left a residue easily woven into a flexible, fabric-like form with the addition of resins. PAN, a colorless, flammable polymer, also makes up the acrylic fibers often found in our clothing.

But there was another problem. To make a superstrength composite, the carbon residue, which does not naturally form fibers, had to be combined with an adhesive resin. Unless

refrigerated, the best resins have shelf lives only hours long. That meant an auto company couldn't economically use them. Dr. Edelman began a long search for the right resin.

Knowing the complex properties of polymers, Edelman's team tested polyester resin "recipes" in one-quart batches. With precise measuring devices, Edelman poured, mixed, stirred and sampled for more than three months. "Each time we finished a batch, we just let it stand at room temperature. If it thickened too fast, or started to smell, we just chucked it out and tried again."

After properly proportioning a host of ingredients called catalysts and inhibitors, Dr. Edelman created a resin with a shelf life of months instead of hours. Auto companies can easily and inexpensively store the resin until they combine it with carbon fibers.

Despite such progress, carbon fiber is still expensive: It costs \$18 a pound (down from \$1000 just 10 years ago). So scientists today are seeking ways to use as little fiber as possible, while maintaining its superstrength.

Luckily, carbon fiber is easily united with common fiberglass, epoxy or polyester resins. And the resulting material marries the best features of both materials.

Supercomposites are used in ways as far out as you can imagine. Carbon fiber composites are baked in ovens to make lightweight wings for the Marine Corps AV-8B VTOL (vertical takeoff and landing) fighter and Navy Hornet fighter aircraft. And researchers say the carbon fi-



Fiberglass strands, from PPG Industries, will combine with resin and chopped fibers to make tough, moldable composite.

bers are indispensable in such esoteric objects as complex frequency filters on RCA's SATCOM communications satellites. In the near future, the space shuttle is to carry 50-foot carbon fiber struts into outer space to build 100-yard-wide satellites.

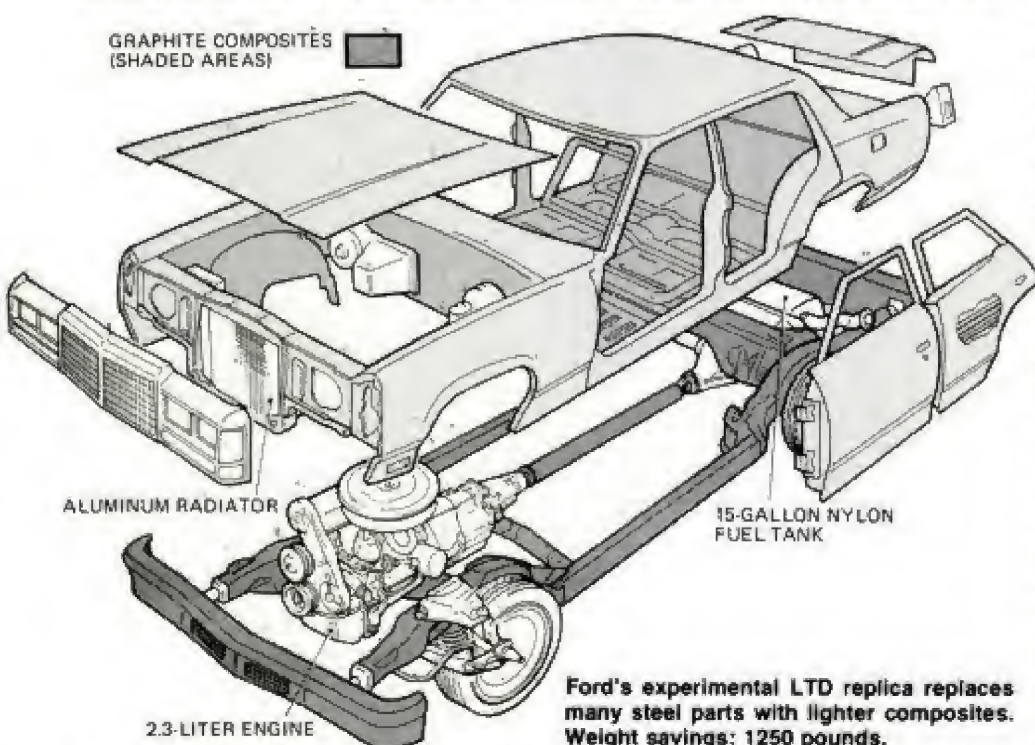
On Earth, the smooth, dark brown, silky fiber—or other newly toughened polymers—may provide your plumbing, garage your motorcycle, or repair the crack in your swimming pool.

New world of consumer products

The Celanese experimental steam press rolls out about 500 expensive carbon-fiber (marketed as "graphite") golf clubs and fishing rods an hour. I bent their light fishing rod as far as I could, trying to snap it. Only my ego did any snapping. The thin, light golf club seems ideal for helping women and elderly golfers make longer drives. Graphalloy Inc. makes these and graphite-fiber tennis racquets. The Shakespeare Co., too, uses Union Carbide's Thornel graphite fiber to make 24 models of its "Ugly Stick" fishing rod.

I also recently tested a new hand iron made with General Electric Corp.'s new composite, Valox. GE and Hamilton Beach use Valox in the handle and upper housing of their new 2-pound, \$19.95 hand irons. I compared the new irons to a standard 4-pound GE Steam and Dry Iron with a plastic and metal housing. On several shirts, the light iron did fine. At comparable temperatures with no more elbow grease, it got the wrinkles out as well as the heavier iron. The only disappointment is that the power cord, made of common plastic, connects to the right side of the iron,

(Please turn to page 174)



IT'S NEW NOW

Indoor antenna

TV reception in apartments can be difficult, especially if outdoor antennas are prohibited. The AT-5000 contains circuitry that allows element rods to be half usual length. Included with unit are a spring-loaded, floor-to-ceiling pole and plant-hanger hooks. About \$43 from Winegard Co., 3000 Kirkwood St., Burlington, Iowa 52601.



Electric cart

Lectra Bug is a four-wheel, electric-powered vehicle that can be built in most home shops for about \$200 to \$400, says the maker. Because of its auxiliary chain drive, it can be licensed as a moped, maker claims. Top speed is about 15 mph. Plans cost \$15 and are available from Lectran Co., Box 1648, Largo, Fla. 33540.



Close to you

The CU-70 kit is Polaroid's system for making close-up photos with SX-70 cameras. It includes three close-up lenses and focusing frames, plus an electronic flash. Lenses provide life-size, 2x and 3x magnification. Kit, with case, SX-70 Sonar One Step camera and accessories, is under \$600. Polaroid Corp., Cambridge, Mass. 02139.



Keep your place

Private parking spaces can be kept free of unwanted cars, says the maker of Safepark. Anchored or epoxied to ground, the solid-steel pole stands 32 inches high and can only be swung down when unlocked. It swings up again to prevent auto theft. About \$60. Progressive Systems Co., 6500 North California Ave., Chicago, Ill. 60645.

Pop goes the vial cap

The RX Tool was designed for adults who have difficulty removing childproof caps from medicine vials, the elderly and handicapped especially. The tool is said to remove most types of snap caps regardless of cap position. It's about \$3 from RX Tool Co., 6750 South Clermont St., Littleton, Colo. 80122.



Glue remover

The usual method for removing price stickers, decals and bumper stickers involves scratching them off with a fingernail. A more effective way is now available, according to the maker of Adhesive Remover, which you just brush on. It is said not to burn skin or remove automotive paint. A 4-ounce can is \$1.79 from Sierra Enterprises, 2134 Dickerson Rd., Reno, Nev. 89503.



1980 BOATING



Wellcraft's high-performance 30-foot Scarab Sport can take twin new 300-hp Mercury motors.



PM's pick:

A preview of styled-up water performers shows improved looks, speed and fuel economy.

by Bill McKeown
BOATING EDITOR



Glastron runabouts, with decked-in bow (above) or open bow with extra seating (left), now use their SSV hull for 16-footers that claim the soft ride of a V-bottom and the added stability of a tri-hull. Outboard power ranging from 70 to 120 hp is recommended.



Phoenix Marine of Hialeah, Fla., offers latest Jim Wynne double-deckrise performance hull with "propeller pockets" (visible in the transom above) that require only a 22-inch draft with twin gas or diesel engines.

10 boats that are tops for 1980

New power, hull designs, construction materials, styling and performance will be the boating developments to watch this coming year.

Boat shows are already revealing trends that should hold down fuel consumption, while keeping up comfort, sea-

worthiness and dependability in pleasure craft.

Light weight is one way to cut down on the mass that must be pushed through the water, and plastics and metals that have more strength for the same or less poundage are being used. They cost more, but

the makers claim that you'll eventually save the difference in lowered maintenance, gas consumption, and impact on waves, since they skim over rough water instead of through it.

Aluminum, graphite, Kevlar aramid fiber and even exotic space-age metals



Latest Forest Wood Ranger Bass Classic model features "Mr. BASS" (Ray Scott) driving. Wiring for remote tilt is built in.



Formulae Super Cat from Formulae Racing Sailboats, Riviera Beach, Fla., is claimed to be world's fastest at speeds to 25 mph.

Birchbark look, redwood seats, aluminum gunwales and fiberglass hulls style new 12- 15- and 17-foot canoes from Sears.



Multiple features of Hammond V-1940XL St. Tropez include open foredeck, cushioned sundeck aft, transom platform over drive,



Thunderbird's Formula One, its newest high-styled 17-footer, has OMC, Mercruiser or Volvo power options, transom platforms.



Excalibur Executioner, a limited edition 32-footer from racer Reggie Fountain, has turbocharged 475-hp Mercruisers, 87 mph.



Famous gaff-rigged Friendship sloop is now duplicated in fiberglass by Liberation Yachts, Centerville Rd., Warwick, R.I.



Claimed to be legal on lakes where "powerboats" aren't, Fin & Feather's \$995 Bass Barge is pushed by two electric motors.

Glastron V-243 SeaFury offshore fisherman has walk space around cabin, molded bow pulpit. It can take outboards to 280 hp.



One of 46 Bayliner models for 1980, this 25-foot Sunbridge mounts a MerCruiser 145 diesel with a water-cooled turbocharger.



The Kat 416, an inflatable catamaran from Semperit/Steyr-Daimler-Puch, is 13 feet long, weighs 125 pounds, can carry 1000.



Mounting the new three-stage Eliminator Jet from Snake River Marine, Starcraft Islanders are now on Coast Guard patrol.



Good, quick stability test for small hull (if you're a good swimmer) is to stand on one gunwale. Grumman's 3.8 passes easily.

are going afloat more often, and should have the strength to handle the higher outboard and inboard horsepower and turbocharging that have arrived.

Fuel-saving sailboats

Sailboats are a popular way to save fuel, and catamarans and scows are rated fastest of all by sailors who want speed. When choosing your windjammer, you may have more fun by picking one from a class that is popular locally for racing. There's more chance for tuning sailing skills in competition, and a higher resale value when you're ready to trade.

Little boats take less gas or muscle to run, and are suitable for most sheltered waters. Inflatables, particularly, are becoming the answer for boatmen with limited storage space, and some of the latest

models are testing the use of high-strength Kevlar and graphite filaments, as well as synthetic coatings, to give the inflated fabric added durability and abrasion resistance. Veed bottoms are being designed into larger blowups, so there is less slap and pounding as these lightweights plane over choppy seas.

Keep weight aft

Power options with turbocharged diesels, conventional gas inboards, stern-drives and outboards all offer more ranges of performance. The trend in engine placement today is to keep weight aft, and the deep-V hulls allow even standard inboards to be stowed astern for easier planing and ride. Boats burn only a small fraction of fuel used today, and may deliver the most fun per gallon. **FM**

Tabs to trim gas use by half!



With trim tabs full up and engine trimmed out (above), boat can ride bow-high through head seas. With tabs down and engine in (left), hull planes evenly. Left tab up and right down (below) shields against beam seas.



WATER PRESSURE ON
TRANSON TAB LIFTS STERN
TO RAISE HULL ON PLANE



Safer, softer rides and big fuel savings are the bonus benefits of install-yourself hull adjusters.

by Bob Stearns

Trim tabs—sometimes called afterplanes, shims, transom wedges or stern planing boards—have been around almost as long as power boats. However, until prices soared at the fuel dock, they were used only to correct hulls that did not perform properly. Today, though, if properly designed and installed, they

can smooth out the ride while saving a remarkable amount of fuel. Here are five trimming systems, listed in order of effectiveness, that should save you many bonus dollars at the marina gas pump.

Transom shims

These are the most basic form of trim control, and the least expensive, but they are also the most time-consuming to install. A pair of these wedges, secured at the extreme aft end of the boat, with one on each side under the transom (or transom bait wells, if the boat has them), can provide extra lift. Since almost all planing hulls, especially outboards and

sterndrives, are heaviest in this area, the added lift tends to bring the bow down for a smoother, more level ride. It can also stop the tendency of some boats to buck and porpoise up and down as they run.

The primary disadvantage of this system is that a lot of time is consumed in experimenting with different sizes and shapes of these wedges before the best compromise is reached. And because it is necessary for these wedges to be glued or screwed to the bottom of the hull, they cannot be removed easily for adjustment.

If you have to try several different sets before the best are found, you

may find the process is messy. There is a better approach, however, which I worked out a few years ago when I had a boat with an aggravating tendency to porpoise. I installed a pair of simple adjustable shims, one under each transom baitwell. They solved the problem neatly and allowed me to "fine tune" my boat's performance. Fuel consumption tests revealed that in some conditions these shims improved my rig's fuel economy from 5 to 10 percent.

They were simply a pair of 6-inch x 4-inch L plates made of .030-inch stainless steel at a local metal fabricator for about \$20. Four screws at the leading edge of each plate hold it securely under the transom, and each extends astern just enough to allow vertical adjustment with a setscrew. It takes only a few minutes of trial and error running to find the best setting.

The disadvantage of the shim system is that the ideal adjustment is limited to average running conditions. Too much lift and you might get in trouble as your bow started to bury in a steep, following-sea situation.

Preset (manual) trim tabs

These operate in the same way as the adjustable shims, but with an ad-

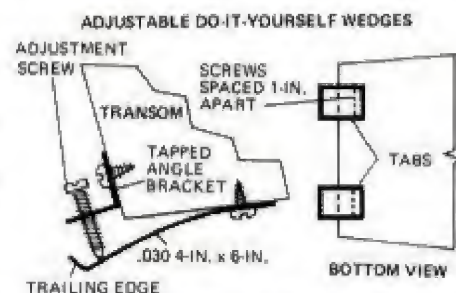
vantage: They are mounted on the transom and extend aft, increasing the effective length of the hull without adding more weight. While offering more lift at the transom, they also increase the planing surface in the area where the load is heaviest and often raise the cruising speed. Obviously, more speed from the same throttle setting means more miles per gallon.

These tabs are available in a wide variety of sizes, shapes and materials. Some are stainless steel, others are aluminum, and a few are space-age plastics. Some are "automatic adjusting"—they are spring-loaded, so that at slow speed the pressure of a spring forces the tabs down for more lift. As speed increases, water pressure hinges them up so that they don't tilt the bow down excessively.

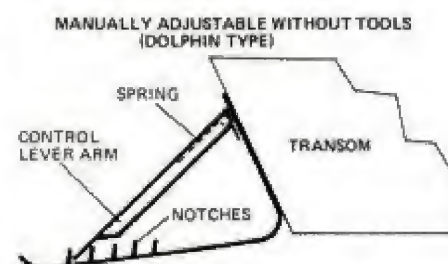
Most preset tabs are adjusted with tools for average running conditions and cannot be changed while underway. One set, however, called Dolphin Trim Tabs, are manually adjustable via a spring-loaded support arm and a series of notches on the upper surface of the horizontal tab. To achieve more lift, you simply stop the boat and reach over the transom, pushing the trailing edge of each tab as far down as you wish. The lever arm



Fixed wedges require trial-and-error fit.



Stainless-steel tabs are bent up at rear trailing edge for stiffness, could be cut 5 x 8 inches, or 6 x 10 for larger boats.



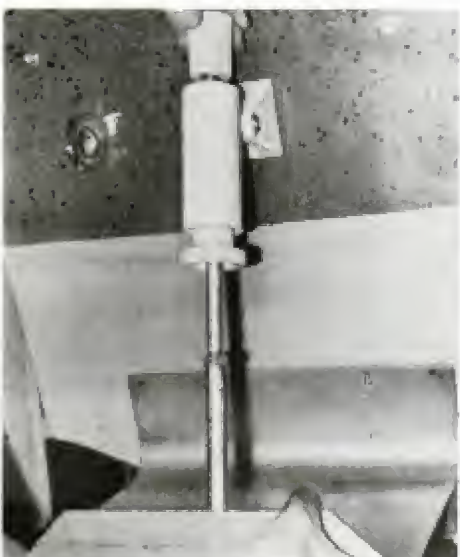
Arm is lifted or pushed for adjustments.



Adjustable homemade tab is controlled by a bolt threaded through brazed nut on L.



Boat must be stopped for manual or tool adjustments for change in trim-tab angle.



"Automatic" tab is spring-loaded, extends down at slow speeds, pushed up by water.



Shown in maximum "up" position, Bennett tab is remotely controlled from the helm.

drops into the corresponding notch and stays there until another adjustment is made.

The advantage of this system is that each tab can quickly be adjusted individually. If you are faced with a long ride home in a nasty cross wind chop, the tab on that side can be depressed further than the downwind tab, thus keeping the boat in a more level and dryer attitude. For a head sea, both tabs can be raised to lessen the possibility of burying the bow when topping a steep wave, and plunging down into the trough.

The disadvantage is that the boat must be stopped each time you make an adjustment. But all the preset tabs can save you as much as 10 to 30 percent on your fuel bill, if they are the correct size for your boat and properly installed and adjusted. Results with every boat will differ somewhat because of variations in hull design, power, load and sea conditions. Cost of these tabs ranges from about \$35 to \$120, depending upon size, materials and design. They are simple and quick to install.

Engine power trim

Available for almost all outboards over 40 hp, as well as many sterndrive models, this adjustable, propeller-angle trim can give extensive control over hull attitude in the water. The

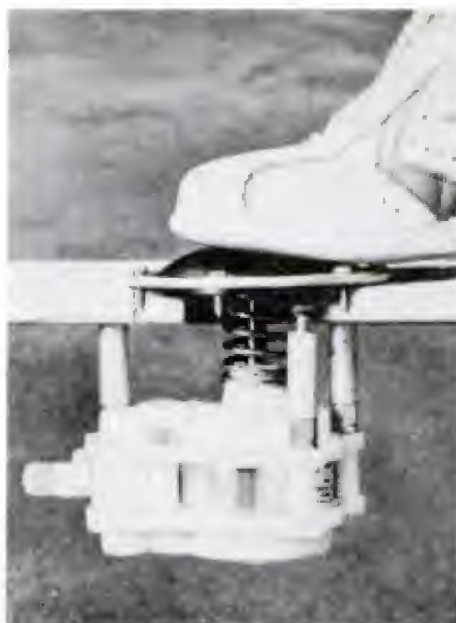
(Please turn to page 143)

New gear to go afloat

Even marine accessories are being made lighter to help cut down fuel-consuming weight aboard. Plastics and stainless steel are helping to reduce maintenance. Smaller engines are lowering the cost of rigs and the gas required for them.

In addition to the small outboards from the big producers—Outboard Marine's Evinrudes and Johnsons, Brunswick's Mercurys and Mariners, and the Chryslers—there are new modest-horsepower, fuel-efficient motors from well established mini-mill producers. Aquabug, Clinton, Eska, Honda, Mighty Mite, Seagull, Sears, Spirit, Suzuki and Wards supply two-cycle outboards that are light, economical and muscular for their size. Often they make a better (and easier to stow) standby engine than a big pair of thirsty twins.

Even electronics is going afloat in small rigs, and no craft is too small this year for a depthfinder and CB or VHF portable radio. **FM**



An out-of-sight pump to fill a sink or drain the bilge of a dinghy while your hands are busy, the small, 2.5-gpm Flush Mount is from Rule Inc., Gloucester, Mass.



With craft up to 30 feet now being hauled on a trailer, Dutton-Lainson, Hastings, Neb., has a StrongArm electric winch to power or hand crank boats up to six tons.



Running shoal water up to six inches thin without tearing up the prop is possible by raising the outboard and attaching a Riffle Runner by Water World, Roseburg, Ore.



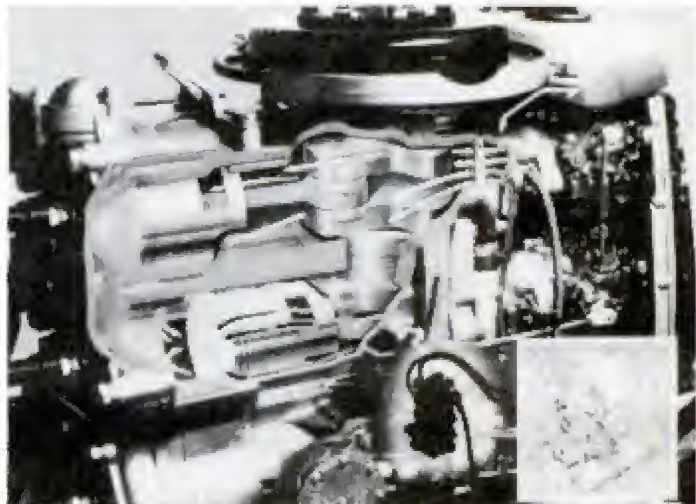
A "Fire Blanket" for boats that should work equally well ashore, this safety item from Goldbergs' Marine, Philadelphia, is said to smother a galley or engine blaze.



For convenience and safety, a stern step makes reboarding easier, and the Transom Platform from Tempress, in Seattle, adds a teak step, can fold up out of the way.



Handi-Mate is made by Bush Products in Lynnwood, Wash. The device clamps on an outboard motor tiller and extends both throttle and steering all the way up to center seat.



Mix of gas and outboard oil is provided automatically by metered oil injection into new Spirit 85, top of 12-model line. Just fill the oil reservoir and the engine does the rest.

WHAT IT'S LIKE TO FLY PEDAL-POWERED

Human-powered flight for everyone moves a step closer with this M.I.T.-designed biwinger.

by Tom Sahagian



The author pedals his way to a 63-second flight; maximum altitude was about 15 to 20 feet. Flight crewman runs along with the airplane to stabilize wings during takeoff and landing.

THE M.I.T. BIPLANE

Wings are mostly space—a combination of aluminum tubing, Styrofoam, balsa and Mylar (right). Air inside weighs about half what wing does. One tough technical problem was stretching Mylar over frame-work, keeping it taut.

Pilot's view of cockpit (top) shows prop, plastic chain, rpm meter. Marks on tube record total flights.

Author receives some assistance with "custom fitting" of his seat (far right).



The ground crew shuddered. "Right! Right!" one of them shouted, as the airplane banked left at a steep 30°. The plane's controls no longer seemed to respond, and the pilot was much too tired to fly properly. A wing-shattering crash looked imminent. As the plane inexorably lost altitude, the pilot closed his eyes and waited for the splintering impact.

But it never came. Somehow, the wings straightened out and the landing became nothing more than a stiff bump. A collective sigh of relief from the ground crew and spectators sounded across the airfield. The pilot collapsed in the cockpit, exhausted.

So ended my last flight in the *Chrysalis*, a human-powered airplane designed, built and flown by students at the Massachusetts Institute of Technology (M.I.T.). Some think high winds (a seven-knot breeze is a stiff gale to *Chrysalis*) made the plane uncontrollable, while others credit pilot incompetence. No matter; it was my most memorable flight.

Flight for the masses

Chrysalis hasn't won any prizes or crossed any channels, but it may have done what its famous cousin *Gossamer Albatross* couldn't do—bring human-powered flight within the capability of almost everyone.

Sometime after Paul MacCready's *Gossamer Condor* won the long-sought Kremer Prize (see *I Pedaled the Mile to Aviation's Big Prize*, page 100, Dec. '77), a group of model-airplane enthusiasts at M.I.T. thought they'd try to fly a previous unsuccessful student-built plane. When they failed, they decided it would be easier to design something from the ground up.

Unlike the *Gossamer* group, the *Chrysalis* people did not seek any prizes or records; rather, they wanted to build a plane that everyone involved in the project could fly. Thus, high performance became secondary to ease of control, stability, durability and ease of construction.

That decided, the basic layout of

the plane came readily: front-mounted prop, rear-mounted control surfaces, and a biplane wing configuration. The design was strictly conventional.

Why a biplane? Because the designers didn't have access to a hangar wide enough to accommodate the 96-foot wingspan of a monoplane design. Also, a biplane could be made stronger.

Most design verification was done on a 1/8-scale model flown inside the M.I.T. gym. Bob Parks and Harold Youngren, the two chief designers, were members of the award-win-

(Please turn to page 172)

A good pilot can easily outdistance ground crew—unless they ride bicycles. Tail position shows plane is still climbing. Note Air Force Thunderbirds in background.



REWIND KNOB



1 No film in the camera. Few goofs can cause more embarrassment than this one, but it happens all the time, even to professionals. Jon Naar, who has published several books, recalls the time he happened upon a raging fire at a hotel in London. He whipped out his Leica and began shooting. Many of the "exposures" were highly dramatic, but the camera wasn't loaded. He and many other pros always watch the rewind knob to see if it turns when the film-wind lever is advanced (see photo, above). A related problem can also be solved this way: Sometimes the film is loaded but doesn't advance. If the knob moves, you're okay. Don't be afraid to waste a frame making sure the film is moving—it's worthwhile insurance.

2 Reshooting a roll of film. Many photographers, especially those who do their own processing, do not rewind the film all the way into the cassette. That way, they can squarely cut off the narrow leader strip in the light, instead of fumbling in the dark before winding the film on a developing reel. But you need a way to distinguish between used and unused film. In the photo at near right, one roll of film has been exposed and the other hasn't—can you tell which is which? You could easily reshoot the used film. Solution: Crimp the end of the leader after rewinding (far right). Some pros go one step further and tear the leader off.

3 Wrong film-speed setting. With today's fast 400 ASA films in both color and black-and-white, many photographers just set the film-speed dial at 400 and forget it. But what's more likely is that you'll shoot color slides at ASA 64 one day, and then perhaps "push" 400 ASA to an exposure index of 800 indoors the next. It's easy to forget to change the dial, and the next roll will almost certainly be wildly over- or underexposed. The best thing to do is to tape the end flap from the film box on your camera back (far right). It will remind you to adjust the film-speed setting. Some cameras now have holders made specifically for an end flap (near right). Other photographers even stuff part of the end flap of the film box into the camera's hot shoe.

Six photo mistakes even the pros make—and how to prevent them

A pro will goof once, and then make sure he doesn't do it again.

by Tom Sahagian



Professional photographers are human; they make mistakes. But since a pro can't goof too often and remain a pro, he usually devises a system to make sure errors don't recur.

Amateurs need not worry about some of the more esoteric boo-boos the pros make, and many photos are ruined by failures in the camera. Such mechanical foul-ups occur more often in equipment that sees everyday use—and sometimes abuse—by a working pro than in amateur gear used twice a month.

We've selected six of the most basic blunders that everyone makes. If you acquire the habit of going through a mental checklist each time you shoot, you'll minimize your goofs. If you do make a mistake, don't be too upset—you're in good company. **PM**

4 Incorrect flash synchronization. This is a common problem because modern flash units are so automatic it's easy to forget that the shutter speed still must be set for proper synchronization. That is, the shutter must open fully as the flash fires. On cameras with focal-plane shutters, proper electronic flash sync is $\frac{1}{60}$ or $\frac{1}{125}$ second, although a few synchronize somewhere in between. Cameras with leaf shutters can sync up to $\frac{1}{500}$ second, but few amateurs use them.

At shutter speeds above proper sync, part of the frame will be unexposed (right) except for ambient light. With some cameras, the entire negative will be black. A small label affixed to the flash unit reminding you to set sync speed should do the trick.

What happens if you set too slow a sync speed? Not much, unless you shake the camera. If there's a lot of ambient light, it could affect the exposure. In fact, it's possible to create an interesting effect by shooting a moving object at a very slow shutter speed ($\frac{1}{30}$ or less) with flash.



5 No lens shade. Many photographers neglect to use lens shades because they think the anti-reflective coating on modern lenses renders a shade useless. Not so. Unwanted light rays can spill into the image area and cause washing out or spurious reflections. Note that even though the image area is rectangular or square, the lens projects a circle. A bright light may not be visible in the viewfinder but still be in the

circle. In the photo above, no shade was used. Much of the top of the picture is washed out, even though the sun was not visible in the viewfinder. In the photo below, a shade was used. Details are much clearer. When the lens is stopped down, little hexagons or octagons can appear in a photo; these are reflections of the lens diaphragm. Often a shade on a lens can eliminate these annoying reflections.



6 Low batteries. As cameras become more and more electronic, and as motor winders proliferate, more camera systems depend on batteries. Some manufacturers have incorporated flashing LEDs or other warnings to tell you when the batteries are running low. Even so, it's possible to be caught with your energy down. The obvious solution is to carry a fresh set with you at all times. Some photographers have two sets of nicads and keep one set always in the charger. Others wrap batteries in a plastic bag (to keep out humidity) and stick them in the freezer. After taking them along as a backup, they are returned to the freezer to prolong life. Make sure cells are brought up to room temperature before use.

If you still manage to become stuck without a backup, here's a possible way to squeeze another shooting session out of a battery: Clean its contacts with a pencil eraser (above). Wipe with a cloth to remove fingerprints and reinstall without touching the contact surfaces. It's wise to change batteries annually, whether you think you need to or not.

4 valentines from your shop

by Harry Wicks HOME AND SHOP EDITOR

Here are four attractive easy-to-make projects useful the year round.

By spending a couple of Saturdays in your workshop building these delightful items you are sure to create the most pleasant Valentine's Day your family has ever enjoyed. We asked designer C.J. Castelberry to come up with some Valentine gifts that our woodworking readers could create for their wives and daughters. Her successful results are shown on the facing page.

To assure surprise, you'll have to keep your shop off limits while the projects are in the works, but the secrecy will only add to the enjoyment when the recipients open their presents.

Construction is easy

Happily, we were able to retain the boutique-like look that the designer wanted — even though the goal was to create the prototypes in wood with the least amount of effort. The result is that

sanding and/or planing, use a hollow ground planer (or finer) blade to cut out all parts on the table saw.

■ For cuts made with jigsaw or band-saw, use the finest-possible blade that won't break when turning a sharp radius.

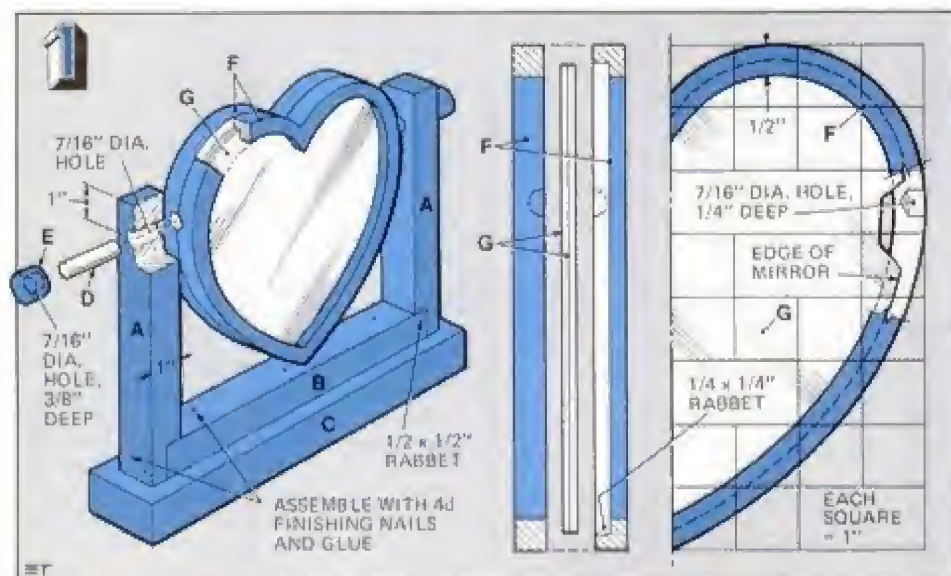
■ Sanding of scrolls (heart shapes) goes very quickly if you use a flap-type sander (such as Merit Abrasive's Sand-O-Flex) in either portable drill or drill press.

■ Seal all parts before painting with a thinned coat of shellac; thin 3-lb.-cut shellac one part shellac to three parts denatured alcohol. A pigmented shellac, such as Bin or Enamelac, is an even better primer. These can go on full strength as they come from the can.

■ For the multicolored items — mirror and varicolor jewelry box — our designer used acrylic paints which are available in artists' supply stores. The acrylic paints are water soluble. When completely dry

MATERIALS LIST—RING CADDY

No.	Size and description (use)
1	1/4 x 6 x 10" plywood (hand)
1	1-3/4 x 2-3/4 x 5-1/2" hardwood block (base)
Misc.	Felt, 1/4" brass cup hooks, sandpaper, acrylic paints, clear sealing spray



all of the projects can be easily reproduced by anyone with a typical home workshop. The mirror project requires the greatest carpentry skill — and certain tools — (you will need handscrews to hold vertical legs and mirror in alignment when boring the dowel hinge holes). Before starting any of the projects, take the time to study the construction drawings provided, and do read through all instructions.

General instructions

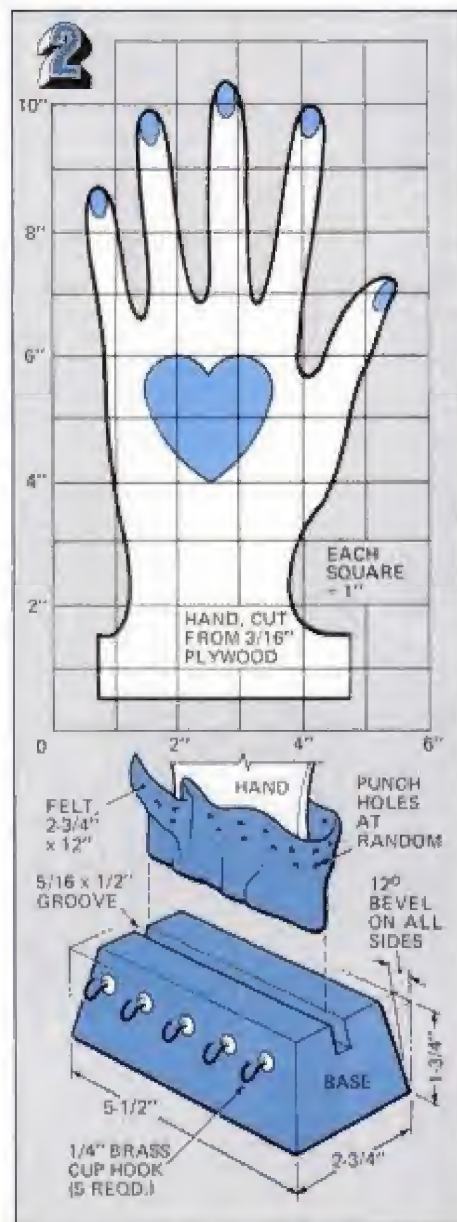
■ To minimize the time needed for

MATERIALS LIST—MIRROR

Key	Pcs.	Size and description (use)
A	2	1 x 1 x 8-1/2" pine (uprights)
B	1	1 x 1 x 10-3/4" pine (sub-base)
C	1	1 x 2 x 11-3/4" pine (base)
D	2	7/16 x 1-3/4" dowel (hinges)
E	2	3/4 x 3/4" dowel (hinge caps)
F	2	1/2 x 8 x 8" plywood (heart)
G	2	Custom-cut heart 1/8" mirrors
Misc.		4d finishing nails, shellac, sandpaper, acrylic paints, Krylon clear spray (No. 1301).

they should be protected with several coats of a clear, compatible sealer. I used Krylon's No. 1301 clear spray on the projects shown.

■ For projects where a high gloss is



Stylish ring caddy (above) is a super-easy valentine to make. The mirror (at left) requires a little more skill.

desired, use enamel. For the red jewelry box and the crayon holder I opted for a relatively new aerosol paint called LeSpray. Though the paint produces a very high gloss finish, it is a water-soluble coating. Thus, cleanup is fast and easy. The same product is also available in a brush-on form called LeBrush, if you prefer brushing on to aerosol cans. (Available at hardware and paint stores, both versions of this paint are manufactured by Sensico Inc., Oakland Calif. 94608.)

(Please turn to page 193)

Project designs: C.J. Castelberry
Construction by the author
PM color photo: Harry Hartman



1 Frame for tilting heart-shaped mirror is constructed of $\frac{1}{2}$ -in. plywood. The tilt action is made possible by force fit.



2 Our attractive ring caddy keeps rings, small jewelry convenient on a vanity. A felt cuff holds earrings in full view for easy selection.

3 Solid-wood, linked hearts bored with many holes become a handy crayon holder for your youngest valentine.

4 Layered-pine jewel box can be painted in stripes or solid as shown. A circular cutout is affixed to top's underside to assure alignment when the box is closed.



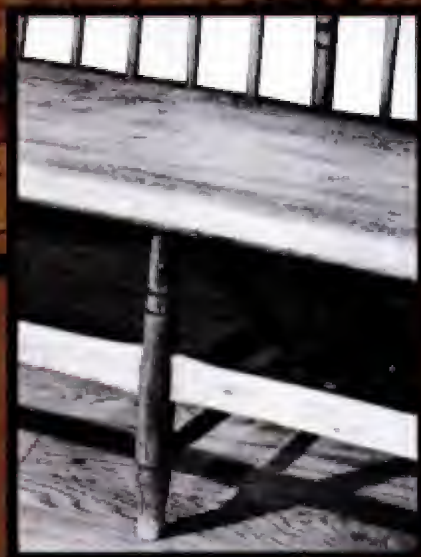
3



4



A PM Reproduction



Reproduction (top), is a ringer for the original (above) minus years of wear as a resting place for weary clients who visited Lincoln's law office. Details such as the coves on the bench leg (left) have been carefully and exactly duplicated.



From Lincoln's law office: A handsome pine and maple bench you can build

The original is preserved in the Law Library of the Old State Capitol Building in Springfield. The Illinois State Historical Library has granted PM permission to reproduce the piece exactly.

by David Warren

By the early 1840s, Abraham Lincoln had become a successful Springfield, Ill., attorney. His practice had grown rapidly, in recognition of his abilities in law, his quick grasp of argument, his sincerity and his lucidity of speech. However, Lincoln possessed another important attribute—he had a genuine appreciation of good design in furniture.

The bench he picked for the waiting area of his law office is a real beauty. It is constructed of pine and maple and is 19 inches wide by 78 inches long. We used the same woods to build the reproduction. Design features include a plank seat, Windsor arrow back and trestle leg assembly.

Before you begin construction, make several construction aids to assure accurate cuts and tight-fitting joints.

First, make a full-scale drawing of an end view, showing leg- and back-support angles and the spacing of the arm stays. Then make a full-scale drawing of the front and back of the seat ends. Next, draw a bottom view of the settee from the end to the center, showing legs, stretchers and angles. Save time by drawing only half, since the remaining half is a mirror image and locations and angles are merely flopped during construction. Finally, draw a full-scale top view of the same half, showing back-support and arm-rest locations and angles, and the spacing of arrow-back pieces.

Templates are also necessary for the Lincoln settee. On heavy cardboard, draw one for scooping out the seat area. Draw one of a back leg and one of a front leg. Also, make a template for the front and back corners of the seat. Then cut out the shapes using a utility knife.

Use the full-scale drawings as an aid to make sight guides that let you line up holes to be bored at proper angles. You will need a sight guide for each rear leg and for each front leg. Note that the borings for the corner legs are at compound angles. Cut the guides from 2x4 scrap, six inches long.

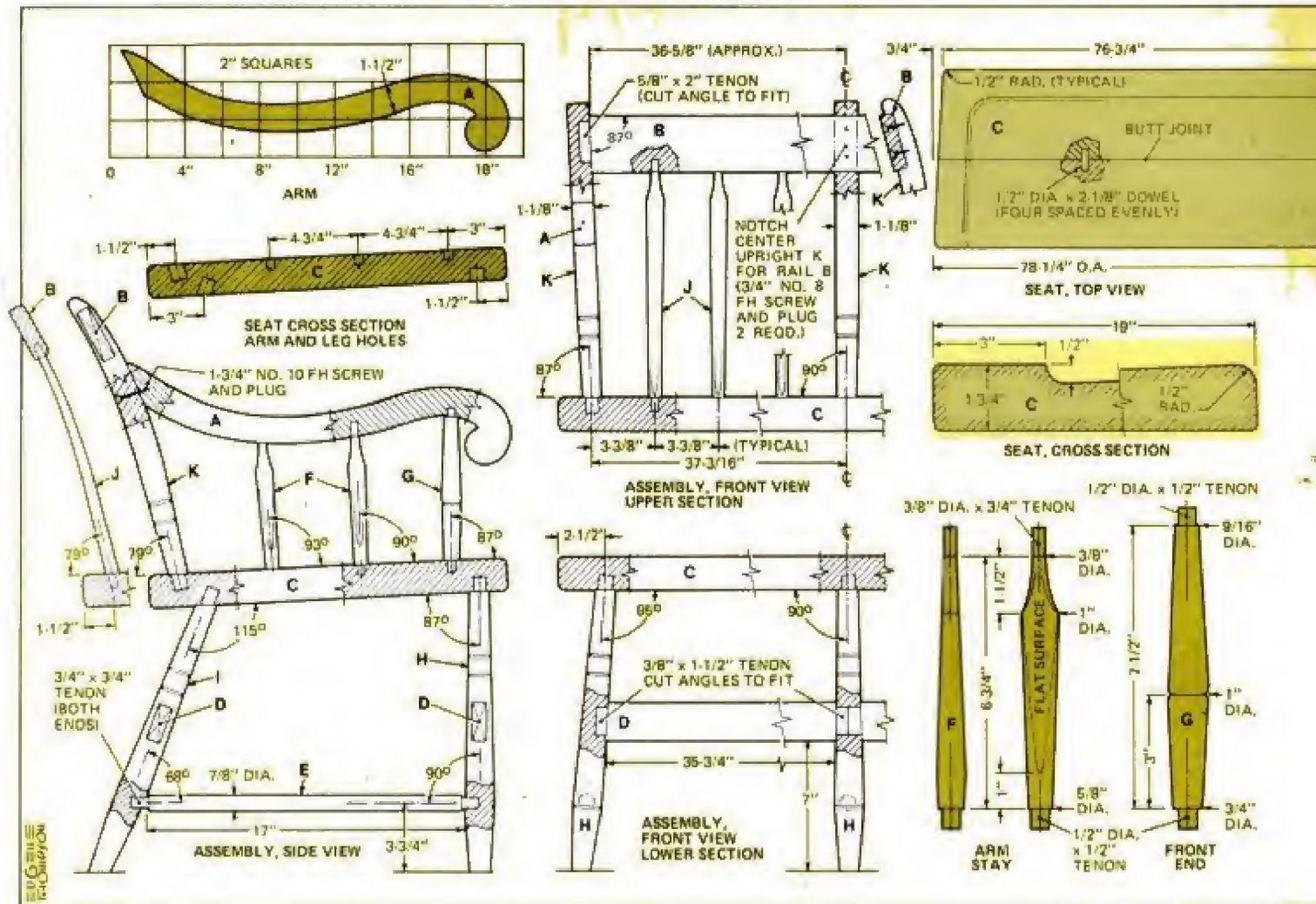
Begin construction

Using the drawings, lay out and turn the arrow-shaped arm and back stays. Then plane the flat areas as required while the workpiece is held rigid in the lathe.

Bending the stays

Make the bending jig as shown in the photo. It will bend two stays at a time. Soak them for four hours. Then

PM photos: Matt Doherty
Cabinetmaker: Ray Peterson



Rough square stock to round for arm stays using a gouge. Then use skew to turn to final diameter as shown in plans.



After stay has been turned and coves have been cut, sand smooth with 220-grit paper while workpiece turns in the lathe.



Turn 20 arrow-shaped back stays, using a cardboard template to check contour and to assure uniformity during the turning.

Before you remove stay from the lathe, plane two flats on opposite sides of the workpiece as indicated in the plans.

Use a shop-made jig constructed like the one shown below to bend and clamp each water-soaked back stay until dry. The jig

should bend the curve slightly tighter than exact contour of the back to allow for spring-back upon release from the jig.



WEEKEND WORKSHOP: 4 great projects

Automatic center finder



In use, pencil marks centerline when gauge straddles workpiece and underside pegs remain in contact with the board's edges.



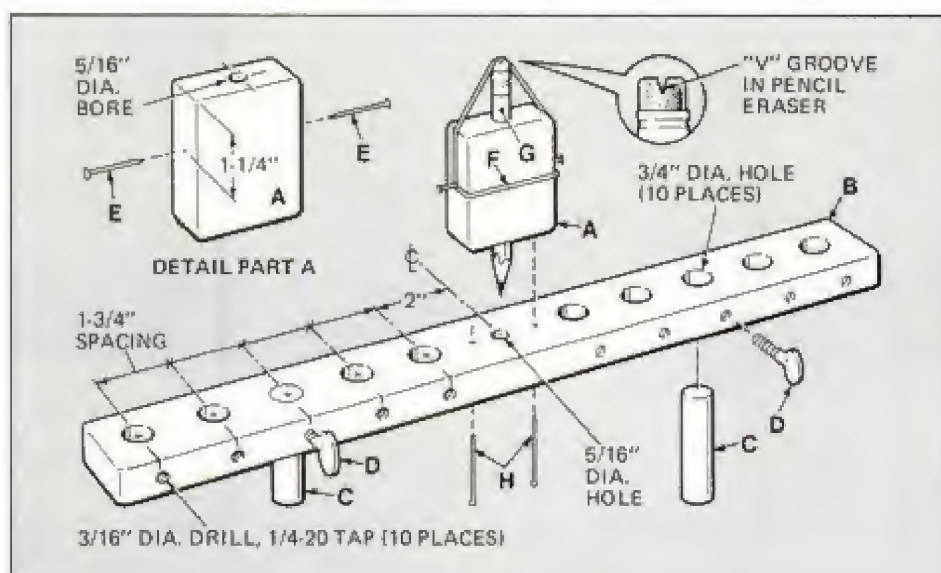
Tap the 3/16-in. holes in the center finder's edge for thumbscrews which lock guiding 3/4-in. dowels into position.



Use drill press to bore 5/16-in. center hole, as well as 3/4-in. dowel holes. All holes must be perfectly centered.



Rubber band acts as spring to put pressure on pencil for marking workpiece. Fixed pencil would make finder arm rock.



When making the center finder, keep in mind these tips:

1. Each dowel hole must be bored precisely the same distance from the pencil hole as the corresponding hole on the opposite side.
2. All holes must be perfectly centered.
3. Use a brad-point bit in your drill press to bore holes accurately.
4. Use a thin, weak rubber band (No. 18) to provide gentle spring action for pencil.

MATERIALS LIST—CENTER FINDER

Key No.	Size and description (use)
A	1 1-1/16 x 1-3/4 x 2-1/2" hardwood (pencil block)
B	1 1-1/16 x 1-3/4 x 20" hardwood (arm)
C	2 3/4" -dia. x 2-1/4" dowel
D	2 1/4-20 x 1" thumbscrew
E	2 1" escutcheon
F	1 No. 18 rubber band
G	1 pencil with rubber eraser
H	2 6d finishing nail

Misc: White glue, tack (optional), oil finish (optional)

A V-notch cut into the tip of the eraser or a tack will hold the rubber band in place.

— Robert Bessmer

Pivoting radial-saw rip fence

This versatile, long-lasting fence pivots and can be adapted to cut any right- or left-hand angle. To build it, cut a board the length of your saw table. Install it in the table slot and mark the location of the saw blade's path. Next, lay out and center-

punch the four holes to be bored (see plans). Use a drill press to bore holes and then rip the fence in half lengthwise. Glue dowels into holes in the top half of the fence, letting them protrude at the bottom. When they're dry, align the dowels

with holes in the bottom fence half and assemble. Cross cut the assembly at the blade path mark.

Aligning fence with blade

Clamp the fence halves into the table

for your shop

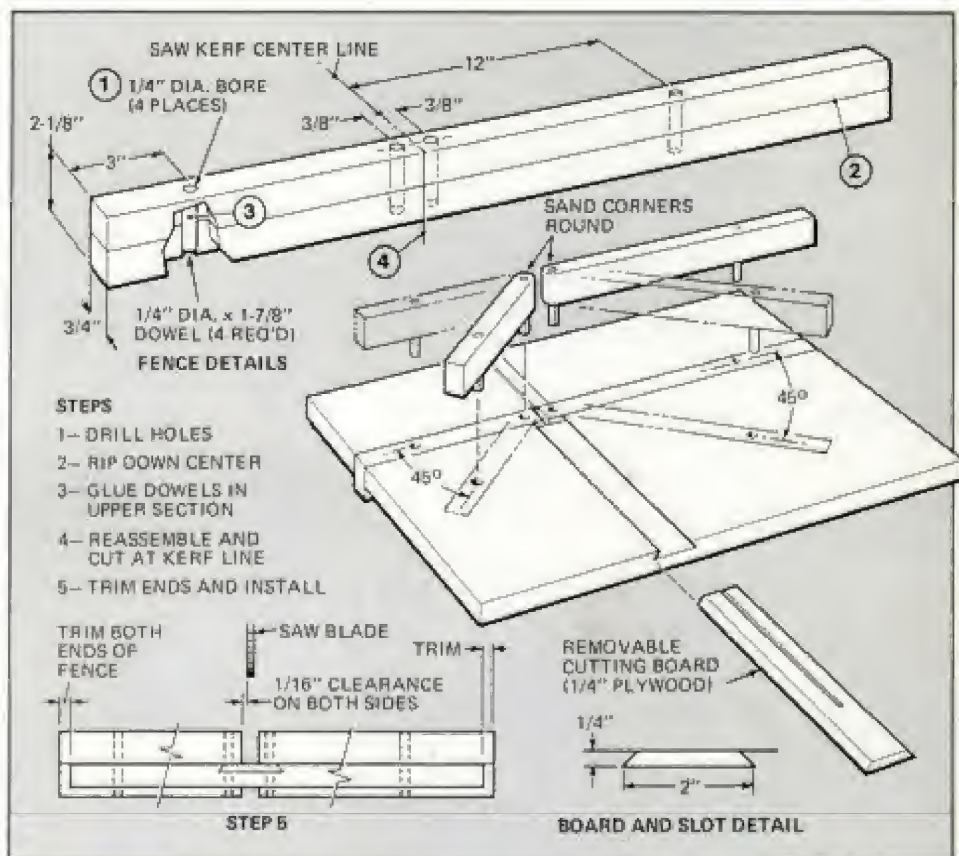


Hardwood fence has dowel hinges which allow it to pivot for cutting angles.



Removable section can be replaced after many cuts (which destroys the surface).

slot and install your widest-kerf-cutting blade. Then slide the fence sections to allow 1/16 in. blade clearance. Mark the fence ends flush with the table ends, remove and trim. Slightly round the corners at the pivoting ends of the fence.



If desired, a rule can be marked on each fence section. The tapes from a discarded tape measure can also be used. Cut tape at the 1-in. mark and fasten it to the fence section, so that the tape begins precisely 1 in. from the blade.

Bore holes in table

To lay out holes in the saw table which

lock the fence for cutting at 45° or at another angle, pivot the fence into the angle position, mark the hole, centerpunch and bore, using guide to keep the hand drill vertical.

Note: When using your saw to cut bevels and compound angles, slide fence to the right, so that the blade will pass through the opening.—Dr. C. D. Smith

Mobile accessory or tool cabinet



Compact cabinet (above) organizes tools or accessories in drawer and pull-out shelves; it also has door pockets for manuals (left).

This mobile cabinet was designed to store accessories for a radial-arm saw. It was sized to fit under the radial-saw

table extensions which were featured in *Build PM's Compact Table for Your Radial Saw* (page 122, Feb. '79). The cabinet can also be used to store an assortment of portable power tools. Casters let you roll the cabinet to any work station.

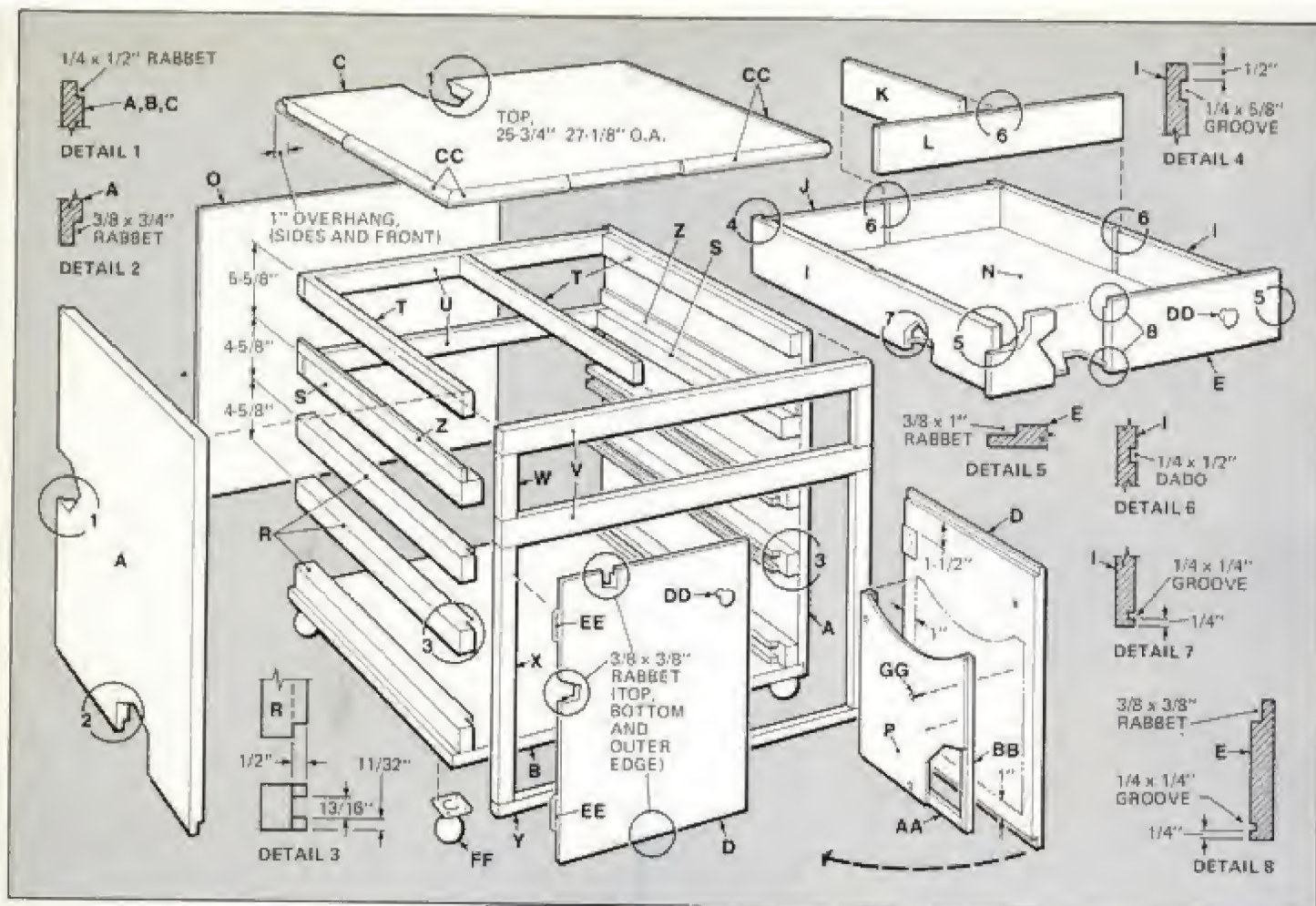
How to build the cabinet

Construct the cabinet as shown in the plans. Install the pull-out shelf slides and the drawer slides prior to joining the sides (A) and back (B) to the top (C). Use glue and finishing nails to make the final assembly. Check for squareness as you go.

Next, make the drawer and pull-out shelves. The dividers can be arranged to suit the tools which you will be storing.



WEEKEND WORKSHOP:



Accessory cabinet can be parked under extension to radial-arm saw table. Note that parts G2 and H2 (not shown in drawing) refer to bottom pull-out tray dimensions.

Additional 1/4-in. dividers may be added after assembly by using zip clips (see materials list).

Make the cabinet doors with a standard 3/8-in. rabbet along three edges. The door pockets have perforated hardboard fronts to allow you to blow out dust that may collect inside. Be sure there is sufficient clearance for the door to close com-

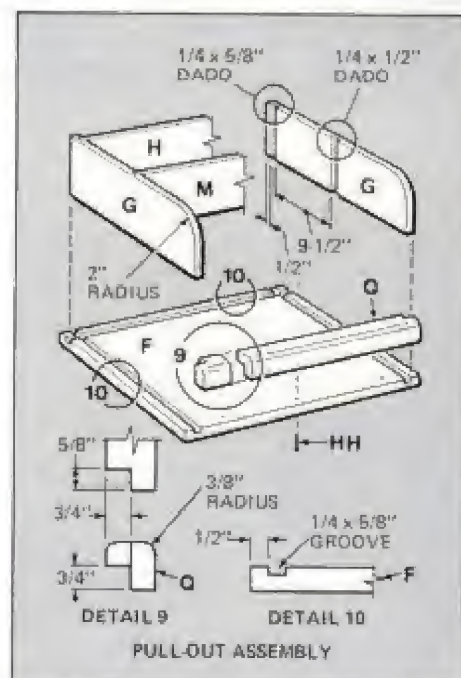
pletely. The drawer slide ends must be notched as shown in the plans to avoid interference with the door pockets.

The choice of hardware is optional. We used wooden knobs with self-closing, 3/8-in. offset hinges.

Finally, add plate-type casters to the 3/4-in. plywood bottom and coat with clear, gloss polyurethane for a durable finish.—C. E. Banister

MATERIALS LIST—MOBILE CABINET

Key	No.	Size and description
A	2	3/4 x 23-3/8 x 24 plywood
B	1	3/4 x 24 x 24-5/8 plywood
C	1	3/4 x 25 x 26-1/8 plywood
D	2	3/4 x 11-7/8 x 16-1/8 plywood
E	1	3/4 x 4-3/8 x 23-3/4 plywood
F	3	3/4 x 21-1/2 x 22 plywood
G1	4	5/8 x 3-1/2 x 22 pine (planed from 3/4 stock)
G2	2	5/8 x 4-3/4 x 22 pine (planed from 3/4 stock)
H1	2	5/8 x 3-1/2 x 19-3/4 pine (planed from 3/4 stock)
H2	1	5/8 x 4-3/4 x 19-3/4 pine (planed from 3/4 stock)
I	2	5/8 x 4 x 23 pine (planed from 3/4 stock)
J	1	5/8 x 4 x 22-1/4 pine (planed from 3/4 stock)
K	1	1/2 x 3-1/2 x 10 plywood
L	1	1/2 x 3-1/2 x 22-1/4 plywood
M	3	1/2 x 3-1/4 x 19-3/4 plywood
N	1	1/4 x 22 x 22-1/4 plywood
O	1	1/4 x 22-7/8 x 24-5/8 plywood
P	2	1/8 x 10 x 10-1/2 pegboard
Q	3	1-1/2 x 1-1/2 x 20-1/2 fir or pine
R	6	1-1/2 x 1-1/2 x 23-3/4 fir or pine
S	2	1-1/2 x 1-1/2 x 23 fir or pine
T	3	3/4 x 1-1/2 x 23 fir or pine
U	2	3/4 x 1-1/2 x 25-5/8 fir or pine
V	2	3/4 x 1-1/2 x 25-1/8 fir or pine
W	2	3/4 x 1-4-1/8 fir or pine
X	2	3/4 x 1 x 15-1/2 fir or pine
Y	1	3/4 x 3/4 x 25-1/8 fir or pine
Z	2	1/4 x 3/4 x 23 fir or pine



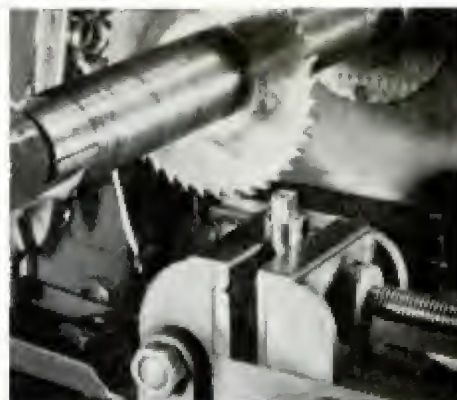
AA	4	1/2 x 1/2 x 10-1/2 fir or pine
BB	2	1/2 x 1/2 x 9 fir or pine
CC	as reqd.	3/8 x 3/4 half round
DD	4	1" dia. wood pulls
EE	4	3/8" offset, self-closing cabinet hinges
FF	4	2" dia. plate-type casters
GG	6	No. 6 x 1" screw
HH	9	No. 12 x 1-1/4" screw

Misc: White glue, finishing nails as reqd., zip clips for extra partitions (zip clips are available from Craftsman Wood Service, 2727 South Mary St., Chicago, Ill. 60608)

Rotary punch for neat holes



Rotary punches can be used to cut 1/2-in. holes in cardboard with a drill press (left), or 1/4-in. holes in leather by twisting punch held in tap wrench (above).



After cutting blank for punch, mill square tip so punch can be used in tap wrench.



Use a center drill to insure precise start of twist drill in punch blank.



For machining inside bevel, compound slide, set at 65°, controls tool travel.

Rotary punches make neat, round holes quickly in thin materials. Instead of pounding them to make them perform, they are rotated, either by hand or power, and act as clean-cutting circular knives. A rotary punch can cut clean holes in felt, cardboard, leather, paper, plastic upholstery, cork, cloth and balsa wood.

The punches are made from high-carbon drill rod, to be used in a conventional tap wrench or a 1/2-in. drill press chuck. They can also be adapted for use in portable electric drills or hand-cranked drills by turning their shanks to suit your drill.

A punch can be made with either an inside or outside bevel on the cutting edge. An inside bevel (see plans) will make holes equal to the cutter's diameter. Outside bevels will make discs or plugs to the cutter's diameter. Since the cutting edge is so thin, however, holes punched by outside-bevel punches will be practically the same diameter as the punch bore.

Begin making a punch by machining a blank true and flat at each end. Then square one end to fit a tap wrench, using a milling machine or by grinding or filing.

A collet chuck holds the punch for drilling and machining the bevels. Spot hole with a center drill. Then drill to the desired diameter. After the hole is made, use the lathe compound slide, set at 65°, for machining the inside bevel with a tool bit slender enough to enter the hole without dragging. For outside bevels, set compound slide at 80°, invert tool bit in its holder and feed into the punch blank from rear. Take successive cuts until a sharp cutting edge is formed. Then hone with an abrasive stone.



For outside bevels, invert tool bit, set slide at 80° and feed against blank.

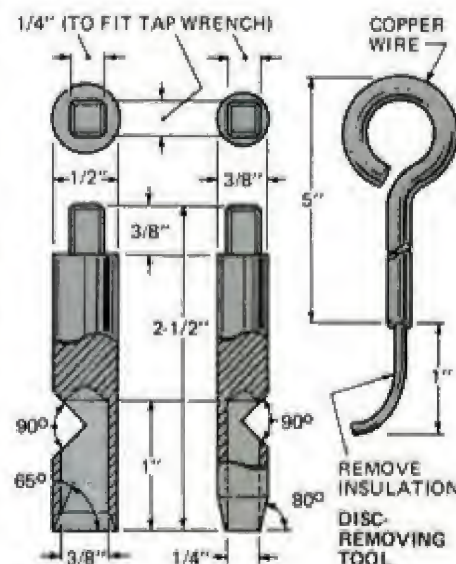


Cut notch in punch with hacksaw to permit ejection of cut discs with aid of wire.

After the lathe work is done, clamp punch in a vise, and saw and file smooth a V-shaped notch at the shank-end of the bore. This opening is necessary for removing cut plugs from the punch bore. A handy tool made of No. 10 copper wire (see plans) is ideal for pushing out the cut plugs through the notch opening.

Harden and temper cutting end of each punch by heating to bright red and plunging it into cold water. Reheat the end until a straw color appears on a brightened area at the cutting edge; douse in water. Polish entire punch with abrasive flap wheel.

Material to be cut by your rotary punch should be supported by something that won't yield too readily, but will not damage the punch edge. White pine and linoleum make good surfaces. — *Walter E. Burton*



HOW TO MAKE Room at the top... with class

1 BEFORE



With careful planning this homeowner turned a cramped, makeshift attic studio into a spacious room used by the entire family.





1 Prior to remodeling, attic space served as a combination storage room and den.

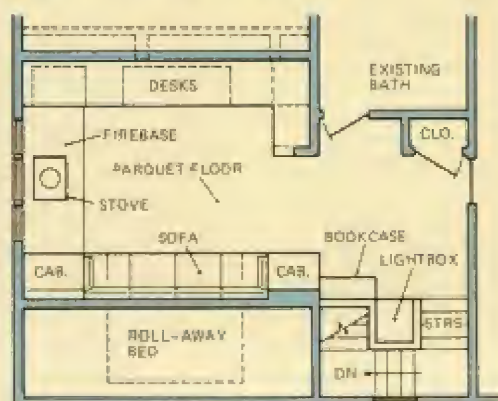
2 In about 10 months' worth of doing-it-himself on weekends and occasional weekday evenings, homeowner transformed room into multi-use space.

3 Large, well-lit work surfaces with recessed wall storage and cabinets below provide couple with enough elbow room for independent, varied pursuits.

4 Couch with roll-out trundle bed becomes a cozy resting place for overnight guests.



An attic is not generally thought of as a spacious, airy, abundantly lit, well-organized room, but *PM* staffer Don Mannes, with design help from architect Ira Grandberg, has succeeded in creating one. The primary reason for the remodeling was to provide in-house office space. Don, an artist, required a drawing board and lots of counter and storage space for art supplies. His wife, Barbara, a schoolteacher, also needed a lot of desk area, plus plenty of room for files.





SHOPPING INFORMATION

For buying information or the nearest dealer, write directly to the manufacturers listed below:

Carpet, Delicious style in Crown gold color, Bigelow-Sanford, Inc., Box 3089, Greenville, S.C. 29602; **Chairs**, Crown Discount Corp., 3128 Queens Blvd., Long Island City, N.Y. 11101; **Counter laminate**, White, WilsonArt, Ralph Wilson Plastics Co., 600 General Bruce Dr., Temple, Tex. 76501; **Fireplace**, Venus model, The Majestic Co., 245 Erie St., Huntington, Ind. 46750; **Sofa fabric**, Saddleback Naugahyde in Nutmeg, Uniroyal Inc., 1230 Avenue of the Americas, New York, N.Y. 10020; **Parquet flooring**, Cumberland II oak parquet in chestnut brown, E.L. Bruce Co., Inc., 4255 LBJ Freeway, Dallas, Tex. 75234; **Lighting**, Continental and Universal style track lights, wall-wash floods and recessed-eye recessed lights and Venti series spheres, Halo Lighting, 400 Busse Rd., Elk Grove Village, Ill. 60007; **Textured paint on ceiling**, Easy-Tex, Gold Bond Building Products, Div. National Gypsum Co., 325 Delaware Ave., Buffalo, N.Y. 14202; **Wood paneling**, Capri Elm, Weyerhaeuser Co., Tacoma, Wash. 98401; **State hearth**, A. Dally & Sons Corp., Box 27, Pen Argyl, Pa. 18072; **Windows**, Carlad casements, Caradco Window & Door Div., Box 920, Rantoul, Ill. 61066; **Accessories**, Afghan kit, Bucilla Co., 30-20 Thomson Ave., Long Island City, N.Y. 11101; **Desk accessories**, Bouton's, Spring Valley, N.Y. 10965; **Rug**, Victor Henshel, Inc., 1061 Second Ave., New York, N.Y. 10022; **Wallhanging/baskets**, Judy Deming of Loomworks, New City, N.Y. 10956.

The room is so well-organized and pleasant to relax in, that by adding a prefab fireplace, it also serves as a family room and place for parties. It can even be used as a guest room. A built-in sofa with trundle bed, which pulls out from behind the wall,

makes the transformation quick and easy.

Originally, the attic was chopped up with small closets and unnecessary partitions. Natural light came only from a pair of double-hung windows. The stairwell was narrow and a shaft that ran up its center to the ceiling obstructed light from the only other window on the floor.

The first remodeling step was to demolish the unwanted partitions. Then old windows were replaced with larger units. Removal of the

central stairwell shaft walls, brought light from the previously obstructed window to the gallery/library area.

The key, however, to making the most of the space, was built-in furniture. The built-in sofa/bed and recessed wall boxes made use of behind-the-wall space which under normal circumstances is difficult to utilize.

Space-saving sofa, trundle bed

The aim was to make use of be-

5 Cabinets at either end of sofa can be used for record albums or for stowing bar equipment and beverages. They are large enough to accommodate a small refrigerator, if desired.

6 Area around the stair landing serves as a library/gallery for books, graphics and wall hangings.

7 An ingenious in-the-floor fluorescent plant lamp, installed in shaft between the stairs also serves as effective night light.

The sofa is framed with 2x4s and skinned with paneling. Cabinets flanking the sofa are of plywood over 1x2 cleat framing.

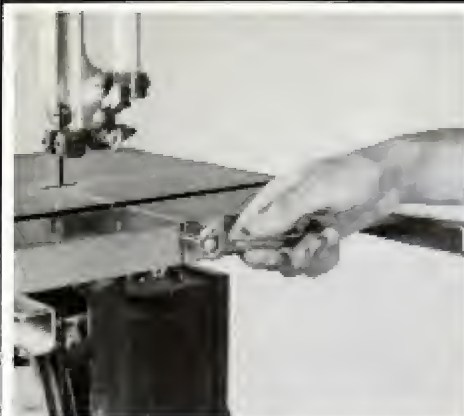
Before you build the desk, cut and frame the rough opening for the shelf

(Please turn to page 180)



WORKSHOP MINICOURSE

INSTALLING A BANDSAW BLADE



Before blade can be changed, table alignment pin must be removed. Though it's threadless, a wrench does it best.

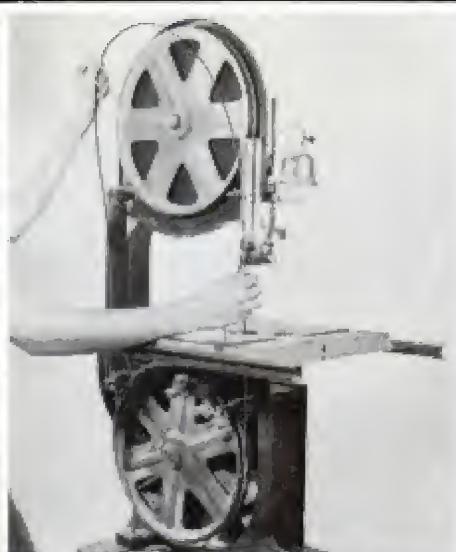
In an earlier column, I mentioned that the bandsaw is one of my favorite shop tools, but I didn't have the space to spell out just why. For one thing, it is a particularly comfortable tool to work with. Using common sense and a little practice, you can quickly learn the basic skills required for safe bandsaw operation. In addition, you can easily make straight cuts with a bandsaw using the appropriate guide, and you have the built-in advantage of being able to cut curves, scrolls and the like. I would hate to have to operate in my wood shop without a bandsaw.

As with all stationary power tools, setup is extremely important. Even a top-quality tool won't deliver if you fail to maintain it properly.

All manufacturers provide good instructions for use and maintenance. Read and understand them so that you are completely familiar with your tool. I keep the manufacturers' manuals (for *all* my shop tools) right in the shop. When an adjustment is required, or some other problem pops up, I have the information at my fingertips.

When removing an old blade or installing a new one on the bandsaw, always disconnect power first. In fact, the blade cover guards should *never* be removed when the saw is plugged in.

Depending upon brand, your saw table will have some sort of alignment pin that must be removed so the blade can go in or out. Take the time to use a wrench as shown, because there is too much of a chance of burring the head (i.e., rounding it off) if you pull it out using a pliers. If



Blade is slipped through slot and positioned on center of both wheels. Teeth travel downward at blade's cutting point.



The blade must then be tracked to assure it's running on the center of the upper wheel. Disconnect saw from power and turn wheel by hand. When blade tracks correctly, tighten wingnut (arrow).



The guide pins are adjusted so they are close enough to blade to prevent it from twisting as work is fed in. Guides should not rub the blade sides. With pins as close as possible, they are adjusted forward or back to ride behind gullets of saw teeth.

that happens, you face an aggravating task each time you want to change blades.

The photographs shown on this page illustrate basic steps for adjusting a bandsaw. Though your brand may sport a nut or bolt of different configuration or size, the rules for setup remain basically the same. *But, remember, check your manual before starting.* **FM**



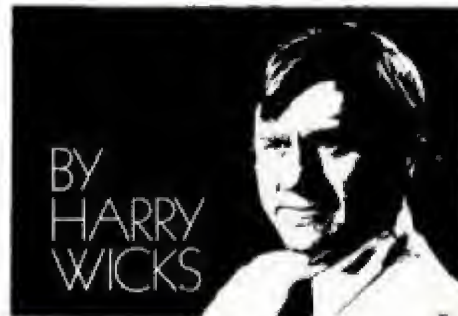
Blade must be tensioned by turning star wheel as shown. Some saws have a tension scale (arrow) that permits quick tensioning—you simply line up fiber washer with the correct tension on indicator. If your saw lacks a scale, tension blade so it has a 1/4-in. flex in a 6-in. span.



Replace the table alignment pin by tapping in with a plastic or wooden mallet.



Next, blade support wheel is positioned about 1/64 in. behind blade spine. Finally, bottom guides—located below the table—are adjusted in similar fashion.



SAWS to desired Width...
PLANES to desired Thickness...
MOLDS all popular Patterns...

Try The
Belsaw In Your
Own Shop On Our
**30-DAY FREE
TRIAL OFFER**

**Mail Coupon Below
For Complete
Details!**

From The Day It Arrives...... the Belsaw will make and save you money. With shortages and inflation driving lumber prices sky-high, this versatile power tool easily pays for itself by quickly converting low cost rough lumber into high value finished stock. In just one pass turn out your own quarter-round, door and window stop, casing, tongue-and-groove... all popular patterns. Other Belsaw operators are making cases for grandfather clocks, furniture, picture frames, fencing, bee hives, bed slats, surveying stakes... all kinds of millwork.

**Start
Your Own
Business!
Earn Extra
Income
Right At
Home.**

With just this one low cost power-feed machine in a corner of your garage or basement, you're set up to supply lumberyards, cabinetmakers, carpenters, remodelers, contractors and hobbyists in your area with custom-planed lumber, trim, molding... ALL of their millwork requirements. You can supply picture molding to art shops, hardware and department stores, or sell direct to framing shops. All standard patterns are available from stock, or we'll custom grind a knife to your own special design or sample.

READ WHAT OTHER BELSAW OWNERS SAY:

A Good Investment • Robert Sawyer, Roseburg, Oregon: "I believe that the Belsaw is the best investment I ever made. I've been a planer man for years and am now retired. The Belsaw has earned me over \$60,000 extra income in the past eleven years."

Pays For Itself • R. S. Clark, Springfield, Ohio: "I bought a bunch of walnut in the rough, and after planing it on the Beltsaw I figured up the money I had saved. It was enough to pay for two-thirds the cost of the Planer. It really does a good job."

More Than Expected • Stephen Schultz, Orangeville, Penna.: "This machine pays for itself by making money out of scrap boards. It is a very well built machine and I confess it is more than I expected for the price. It does everything you say it will."

... And Belsaw Is The Choice Of Professionals:

"I recommend Belsaw's Planer-Molder-Saw as the most useful shop tool that any craftsman could own. We use ours every day in the WORKBENCH model shop, and couldn't get along without it."

JAY HEDDEN—Editor of *WORKBENCH* Magazine

**You Take NO RISK! The Belsaw
Is Backed By Our Exclusive 100%
Guarantee of Satisfaction:**

• "Try the Belsaw in your own shop for a full 30-Days and put it to work for you. Give it a thorough test and make it prove that it can do everything we say it will . . . use it just as much as you want. Then if you are not completely satisfied, just send it back and we'll return every penny you sent. And **YOU** are the sole judge! There are no questions asked . . . *there are no fine print 'use' charges.* Our flat guarantee is that **YOU** must be 100% satisfied or you get your money back."

**FREE
BOOKLET!**

Get FREE
Book with
facts and
full details

RUSH COUPON TODAY!

If coupon has been removed, just send postcard with name and address to:

BELSAW POWER TOOLS Co.
900F Field Building
Kansas City, MO 64111

**Just Mail Coupon . . .
NO OBLIGATION and
NO SALESMAN Calls!**

ACT NOW!
Coupon
Brings
Full Details

BELSAW POWER TOOLS Co.

900F Field Building
Kansas City, Missouri 64111

☐ **YES**, please send me the **FREE** Booklet that gives me complete facts about Belsaw's Planer-Molder-Saw and full details on how I can qualify for a 30-Day Free Trial right in my own shop. I understand there is **No Obligation** and that **No salesman** will call.

NAME _____

ADDRESS _____

CITY STATE ZIP

Turn Extra Time Into Extra Income!
 AT \$100 PER HOUR

See your To...

You Can Build This Clock!

only with a
Craft Clock Kit



You will always remember the satisfaction that you felt in building your own clock. Our new Vienna Regulator is one of the most magnificent wall clocks ever produced, yet you can build it easily and economically using a Craft kit. We make the intricate cuts and preassemble all difficult parts. Your satisfaction is guaranteed. Send today for catalog which contains the largest selection of kits, movements and dials available in America.

New for 1980!

Vienna Regulator in black walnut

CRAFT PRODUCTS COMPANY

Dept. D1, 2200 Dean St., St. Charles, IL 60174

☐ 116-Page Catalog \$1.50 ☐ FREE Brochure

Name

Street

City / State / Zip

Serving America's Craftsman Since 1940

STEP FORWARD INTO THE PAST



FANTastic Facts

- Saves up to 35% on heating costs
 - Quality manufacturing since 1939
 - UL approved
 - 90 day \$ back and 3 yr. guarantee
- To order call 1-800-241-7788
Ga. call coll. 1-404-498-1278
Send 25¢ for color catalogue

UNIQUE ENERGY PRODUCTS

P.O. Box 1009 - Dept. PM-2
Stone Mountain, Ga. 30086

TOP OLYMPIC SPECTACLE (Continued from page 95)

reach the takeoff point of the Olympic inruns at the recommended 60 mph. Excessive inrun speeds are remedied by having the skiers move down the ramp to a lower gate, in the case of the 70-meter hill, or using the 90-meter's unique movable starting platform.

A good takeoff earns points

Judging for style begins at the moment of takeoff. Once jumpers thought it was really keen, and very Norwegian, to stick their arms out on either side, like swan divers. Today that maneuver could cost you a medal. Instead, the contemporary jumper puts his arms back and leans forward, as far as he can, over his skis.

And with good reason. Air travels faster over his gently curved body than under his flat skis. To put it another way, the pressure from below becomes greater than the pressure from above. He has lift.

From its work with computers and wind tunnels, the International Skiing Federation has determined that if a jumper left the ramp pigeon-toed, he would create a large triangle beneath him that would be completely air-resistant. He would find it much easier to fly. The bad news is that it would be impossible to land. Nevertheless, the discovery was not without its practical applications. "We now know," Martitsch says, "that if a jumper keeps his skis separated by about 6 inches, no air will flow through, and he will be carried by the entire area, from the outside of one ski to the outside of the other." In the old days, if you did not keep your skis tightly together, you lost style points.

From wood to plastic

Compared to their Alpine counterparts, jumping skis are long (8½ feet) and heavy, grooved at the bottom so they will stay straight after landing. Once made of 100 percent hickory, they are now mostly plastic, with a wood core. Boots, attached by loose bindings that allow air currents to play with the skis, have experienced a revolution of their own. The newfangled type come up high in the back, so that jumpers will be less likely to "sit down" on the in-run, allowing air to get under their skis. (For details on the latter subject consult Vienko "Agony of Defeat" Bogatej, the Yugoslavian immortalized on *Wide World*.)

On a higher plane, helmets have replaced woolen ski caps, and the once-macho "baggy" look has given way to the finely cut jumping cos-

tume. Before each competition, apparel is tested to make sure air flows through freely. It seems that a few years ago, some jumpers got the idea that if their suits had extremely porous fronts, and rubberized backs, they could "balloon" themselves a few extra meters.

Even if cheating were allowed in this Olympics, it would be hard for America to add to the one ski-jumping medal we've won since the winter games began in 1924. Our greatest hope in the event, though, is 22-year-old Jim Denney of Duluth, Minn. Denney is a fair country lander, but according to Devlin, who will handle the TV commentary for ABC, the United States won't be a world power in ski jumping until our entire team learns to come down more stylishly. Landings are supposed to be accomplished in the telemark position, a shock-absorbing pose in which the knees are bent and one foot is placed slightly ahead of the other one.

Safety over distance

Although distance counts as much as form in each competition, there is no steady assault on the world record—176 meters—as in other sports. "If you want to go farther you just build a bigger hill," says Martitsch. "There is nothing mysterious about it. Of course, there is a limit, a point where the jumper would lose control, just as a cat, if you throw him far enough, will somewhere lose the ability to land on his feet. But do we care where that point is? No. We care only about safety."

Olympic ski jumping is still conducted on good old-fashioned snow, but scientists are working on that, too. Mats of shredded plastic—variously described as looking like spaghetti, a hula skirt and a thatched roof—have been used on European hills for years, and are just now being introduced in the United States. With this innovation, winter is no longer necessary; all you do is water down the plastic and go.

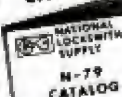
Devlin has never seen a hill wearing a hula skirt. Still, he likes the idea. "We've got to get those things over here," he says. "Then we could practice more. Heck, we might even find us a good jumper in Alabama, and it wouldn't cost us anything! I'll bet Coca-Cola would buy us a mat if we let them put their name on it."

Considering that Coke's colors are red and white, and that the mats remind some people of spaghetti, that would be a most remarkable sight indeed.

WHOLESALE LOCKSMITH SUPPLIES



ORDER YOUR
GIANT
CATALOG



...jam packed with the latest in Locksmith Tools, Key Machines, Key Assemblers, Deadbolts, Foreign Car Key Blanks, complete line of Safes, Closed Circuit TV Systems, Alarm Systems, High Security Locks, Electronic Lock Card Systems, I.D. Cards, Technical Manuals, Code Machines, and much, much more! National's Your One-Stop Locksmith Supply Supermarket. Most orders shipped within 24 hours. We welcome locksmiths, student locksmiths and industrial accounts. To order National's catalog send \$5.00 (refundable after first purchase of \$25.00 or more). Your catalog will be rushed to you by first class mail!

NATIONAL LOCKSMITH SUPPLY, P.O. BOX 31558 DALLAS, TEXAS 75231

To the men & women who want to quit work, someday.

Isn't it about time, you found out, the misunderstanding that most people have about becoming Financially Secure?

As incredible as this may sound, there is a way to accumulate great wealth without working sixteen hours a day, every day, for the rest of your life. But, because of the bold implication of this statement, I would like you the reader to be the judge.

My name is Robert E. Shindler. I wrote a book entitled "The Get Rich Report," but I am **not** going to tell you how to become a millionaire. Furthermore, I am **not** going to show you how to become rich overnight. What I am going to tell and show you are ideas and methods that have made people from all walks of life successful, independent and financially secure for the rest of their lives.

If you are still with me this far, and I hope you are, I would like to share with you some of my accomplishments that I have included in my new book.

Now I know that you expect me to tell you about some "secret success formula", that I found in the attic of some old mansion. Or that I spoke to and studied the richest and most powerful men in the country. **Not true.**

Quite the Opposite

What I learned over the past five years about success and financial independence was quite the opposite from any formulas that you may have heard or read about.

Take Robert Gorman, a middle-aged man from Alexandria, Virginia. He works as a carpenter restoring old houses, because he likes it, and has a net worth of over a million dollars. He owns two office buildings and twenty-five houses (all of which he accumulated over the past seven years starting with nothing).

And then there is Alice Ragan who is a widow with four children from Arleta, California. Five years ago she was flat-broke and so heavily in debt that she came very close to applying for welfare. Today she has over \$250,000 in the bank and 35% ownership in one of the states largest corporations. All of this was acquired by using the same ideas and methods that Mr. Gorman used.

I found that these two cases were not isolated by any means. From one end of the country to the other I talked to small groups of people from all walks of life (all applying and using the same ideas and methods). All starting without any capital and all becoming financially secure.

Definitely Different

The methods and ideas were definitely different. The concept was unique and far superior to anything in any book I had ever read.

I began by putting the information and methods I had learned into practice, revising and improving them to work even faster. I was amazed at the results in just six months.

Today I am my own boss and I am spending a lot of time traveling around the country doing things that I only dreamed about before.

In the first six months of operation, with just one of my methods, I earned over \$100,000. The second half of the year I doubled that figure. After three years of perfecting my methods, I am the president of my own corporation which planned a series of acquisitions back in 1978 which by 1980 should surpass the \$6 million dollar mark.

I'll tell you one thing, anyone can make

\$200,000 a year using my methods and ideas and they would be a fool not to try. Things are tough for people living on salaries. Tomorrow they'll be even tougher.

All over America, new fortunes are being created. People from all walks of life are embarking on an adventure that few experiences in life can match. A journey into excitement, success and — just possibly — great wealth and the kind of personal freedom that few others will ever enjoy.

The Real Proof

But you will find the real proof of my accomplishments at the last eleven chapters of my book. I will show you that you don't have to be a genius, I'm definitely not. You will find that you don't have to live in any particular part of the country. Nor do you have to have experience or outside financing.

My book "The Get Rich Report" will show you more than how to make a substantial income and become financially secure. It will stimulate your mind, and reveal to you NEW ideas and methods that will work for you NO MATTER what kind of job or business you are in. I have already received many letters from housewives, lawyers, businessmen, doctors and government elected officials who have thanked me and profited from the ideas and suggestions in my book.

\$2,800 in Twenty-Eight Days

"I am a retired railroad man 75 years of age. I used to just sleep all day and watch TV at night. Now that I received your Get Rich Report, I have something to do with my time and making money besides. Last month I made \$2,800 using your methods. I could easily double that if I were a younger man. I feel useful again."

Thomas Sheehan
Saginaw, Michigan

A Blueprint for Success

"I am a school teacher. Before that I was in show business — New York, Dallas, Europe. Also wrote for Broadway shows. After seeing a sample of your work I can only say, your systems are like a blueprint for becoming successful. You can count on me. My goals are set very high!"

John McCall
New York, N.Y.

\$24,000 in Four Months

"It seems all my life I've been faced with bills, bills, and more bills. I was always up to my ears in debts, and there never seemed to be any let up. If it wasn't one thing, it was another. I just couldn't get my head above water. Since I started using your methods in your book I've gained a second income of \$24,000 in just four months, besides my regular salary. I am now free and clear of unpaid bills. I have \$34,000 in savings in the bank and I have just purchased a new home \$125,000. It seems like I have a new lease on life."

John Seals
Indianapolis, Indiana

\$14,028.77 in One Week

"Five days after your book arrived I set one of your plans into action. I made \$14,028.77. I have never in my life time, seen a program work so fast. P.S. I still don't have a job."

Joseph Altizer
Springfield, Illinois

\$32,000 in Just Three Months

"Three months ago I took what you taught me in chapter 10 to heart. The results were remarkable. I made \$32,210.00. Not bad for a person with a seventh grade education."

Samuel Thornton
Riverside, California

Those were just some of the comments from people, just like yourself, from all walks of life and various parts of the country. The only difference between them and you is their use of certain basic principles taught in The Get Rich Report. In just one week from now you can know what they know.

I have written the book in plain English to make it easy to read and easy to follow. If you are asking yourself about now, "I wonder if his book is about mail-order?" let me answer you by saying you are dead wrong. The Get Rich Report has ABSOLUTELY NOTHING to do with or about mail-order.

You will find twenty-one chapters that are full of overflowing with facts, methods, ideas and techniques, that are working for me and several hundred others across the country. Methods like: A six month step-by-step plan for building a \$200,000 income without having a job or business. Or the system that allows you to receive \$10,000 two weeks after the book arrives.

You will find that you don't need an education to make these methods work. Nor do you need lots of experience. Both men and women, all ages, are acting on my seasoned advice. What is required? A willingness and a determination to put this knowledge to work for you and your family. Believe me when I say, it does not require you to leave your present job or business and there is positively No Selling or buying of any products. In fact, you don't need to have or rent an office to get started. You can do it anywhere — out of your house or in your apartment. With my methods and ideas you will be able to earn an extra \$5,000 to \$100,000 in a matter of months.

30 Day Free Trial

But I would like you to be the judge. Order your copy of "The Get Rich Report" from NVP Publishing Company on a 30-day trial basis. Make your own test of my ideas and methods. See if they work for you under your everyday conditions. Then if you aren't convinced that "The Get Rich Report" is a good investment, return it within 30 days for a full, courteous and prompt refund. Absolutely no questions asked.

For those who are still a little skeptical — I will go one step further. POSTDATE YOUR CHECK FOR 30 DAYS FROM NOW. I won't cash your check or money order for 30 days after I've sent you my book. Use my methods and ideas for that period and if you don't like them, just send the book back and I'll return your check UNCASHED.

"The Get Rich Report" is published by NVP Publishing Company — a substantial company — additional reassurance that your prudent investment is well protected.

To order your copy at no obligation, simply write the words "The Get Rich Report" on any plain sheet of paper, along with your name, address and zip code. Enclose a check or money order for \$12. Mail your check along with your order to me, Robert E. Shindler c/o NVP Publishing Company, Dept. KK, One NVP Plaza, Box 607, Herndon, Virginia 22070.

NVP Publishing Company, 1979

Discover Camel Lights satisfaction.

The Camel World of satisfaction comes to low tar smoking.

This is where it all started. Camel quality, now in a rich tasting Camel blend for smooth, low tar smoking. Camel Lights brings the solution to taste in low tar.



LIGHTS: 10 mg. "tar", 0.8 mg. nicotine; LIGHTS 100's: 13 mg. "tar", 1.0 mg. nicotine, av. per cigarette by FTC method.

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.

TABS TO TRIM GAS USE BY HALF!

(Continued from page 118)

skipper actually aims the angle of thrust, and he can do it while underway at any speed. Not only do you push the bow down to stop the pounding when heading directly into a nasty chop, but you can also raise the bow higher than normally possible at medium to slow speeds, making it possible to keep "your nose in the air" when running before a steep following sea.

Better still, the helmsman can, by the momentary touch of a button, adjust the craft's running attitude to the optimum for that particular speed and sea condition. Obviously, the power-trim system can also be combined with shims or preset tabs to increase control combinations considerably. Fuel savings possible with a tab-and-power-trim system can run as high as 30 percent, we've found in our test.

Power trim tabs

Power tabs can do everything preset trim tabs will do—plus a lot more. One of their many advantages is the way they can be controlled while underway at any speed. You can also raise one and lower the other individually, and the boat's running attitude responds immediately.

Because the skipper, using simple dash-mounted control levers or buttons, has such precise control over the attitude of his craft, the danger of over-control is almost eliminated. This allows installation of much larger tabs than would be safe or practical with preset trim tabs. The largest power tabs that will fit your boat, in fact, should be used.

You can install these tabs yourself and save money. The pair of 9 x 12-inch Bennett Trim Planes I installed on my 17½-foot Hewes Redfisher took me about four hours of work. The job wasn't complicated, due to their simple design, complete instructions, and prerigged plug-in wiring harness.

The most immediate effect was a noticeable increase in top speed. Without the Bennetts, tops for my rig with a 75-hp Johnson Stinger was 36.7 mph. After the power tabs were installed, it promptly jumped to 39.5. I also measured an improvement in fuel economy that ranged from 10 percent in smooth water to as much as 40 percent when it is rough. Since I can power-adjust the hull's underwater "geometry" at will, I also get a far smoother and dryer ride in all sea conditions. And in addition to the fuel savings, I have less wear and tear on the boat

and on its equipment—radio/telephone, depthfinder, control console and the rest. The result will be improved resale value because of better condition and performance, plus the value of the tabs themselves.

Quality power-trim tabs aren't cheap. Typically they range from \$300 to \$400, plus installation. Because of the fuel they save, however, they could pay for themselves in a few years for an active boatman, without even figuring the probable increases in gasoline prices over that period.

Power trim and power tabs

Combine both systems and you get a result that outperforms either method alone. Now you have precise fore-and-aft control, plus side-to-side trimming which only the tabs can provide. You can now use the trim tabs primarily to offset a crosswind that otherwise would be drenching you with spray. Meanwhile, your engine's power trim can angle your hull up or down for a smoother ride.

You cannot raise your bow with trim tabs. By raising the tabs, however, as far as they would go (slightly above the horizontal), and trimming the engine to the full outward extent of its power trim range, I found that my boat could attain a much higher bow attitude. That would allow running in up to a six-foot following sea, with no tendency to dig in her bow and broach.

Fuel economy, as expected, is increased even more, which my test records clearly show: Without the Bennett power tabs, my fishing boat begins to fall off plane at 3400 rpm and 17 miles per hour. As the hull starts to mush, my miles per gallon drop from 5.6 to 3.5, and my speed from 17 to 10.5 mph. With the power Trim Planes installed, I found I could stay on plane at speeds as low as 11.03 mph and 2600 rpm, as long as both tabs were in the maximum down position and the lower unit trimmed out as far as it would go. Without the tabs, but at the same throttle setting, the boat fell off plane to 7.67 mph, and the miles per gallon dropped 44 percent from 5.0 to 3.4. At the same time, my rpm dropped from 2600 to 2300. If I then moved the throttle back to 2600 without tabs, my speed picked up to only 9.0 mph, and my gas mileage dropped even further—to 3.3. That's 2.03 mph slower, and 52 percent lower fuel economy than the same tachometer speed with the trim tabs.

Obviously, the poorer the sea

conditions, the more dramatic the fuel economy with these two power trim systems. During adverse sea conditions, where it was previously impossible to stay on plane at 17 to 18 mph without punishing my boat and myself, I can now drop to 11 or 12 mph, still stay on plane, and thus save a large amount of fuel—while slogging through conditions when it would be particularly unfortunate to run dry.

Even at my normal 25 to 30 mph cruising speed, the effect of the two trim systems is noticeable. Without them, my best miles-per-gallon is 6.4. Adding power trim alone boosts that to 6.9 mpg, and when I added the Bennett Trim Planes, it jumped to 7.9 mpg. My average cruising speed has also increased by three miles an hour. That's not bad for a 17½-foot boat (18 when you include the length of the tabs). In fact, it's better than some cars.

Safety benefits are a bonus

Safety improvement is also a trim tab bonus you should not overlook. Getting home ahead of a storm through choppy and gas-consuming headseas can be a worrisome problem. Reducing the punishment of a pounding ride, plus the chance of a broach, make tabs even more worthwhile.

Your boat will produce different results than mine—every craft does, because of differing hull designs, size, loading, power and water conditions. But by using these principles, you should be able to reduce your fuel consumption and improve performance to a significant degree. Your percentages may even trim mine! **FM**

MANUFACTURERS LIST

Manual or preset

Diversified Products Co., 1136 Venice Blvd., Los Angeles, Calif. 90015. Preset.
Dolphin Marine Sales, 5901 Northeast 14th Ave., Fort Lauderdale, Fla. 33334. Manually adjustable with tools.
Glen L. Marine Designs, 9152 Rosecrans, Bellflower, Calif. 90706. Preset.
Olson Industries, Box 2520, Sarasota, Fla. 33578. Automatic adjusting (spring-loaded).
Scott Molding Co., Box 2958, Sarasota, Fla. 33578. Flex-A-Trim flexible plastic, automatic adjusting.
Tempe Products, 6200 Cochran Rd., Solon, Ohio 44139. Automatic and preset.

Remote controlled

Bennett Marine, 550 Northwest 12th Ave., Deerfield Beach, Fla. 33441. Electric-hydraulic.
Boat Leveler Mfg., 7305 Natural Bridge St., St. Louis, Mo. 63121. Electric-hydraulic.
Glen L. Marine Designs (see above).
Hummel Mfg., 164-02 95th St., Howard Beach, N.Y. 11414. Air-operated.
ICM Marine Products, 1140 West 15th St., North Vancouver, B.C. Hydraulic.
Kiekhafer Aeromarine, Box 1458, Fond du Lac, Wis. 54935. K-Planes hydraulic.
L. Saraga Inc., 121-26 Dupont St., Plainview, N.Y. 11803. Electric-hydraulic.

NOW YOU CAN GET JUICED AT A YAMAHA DEALER.



EF1200

EF2600

EF1800

Yep. Yamaha makes portable generators. The kind of portable generators that you would expect Yamaha to make.

Technically advanced, simple to operate, lightweight, compact and exceedingly reliable.

A capacitor discharge ignition produces a strong spark under any working condition. And virtually no maintenance is required.

Few, if any, manufacturers offer C.D.I. throughout their entire generator line. Yamaha does.

A feature completely unique to Yamaha is an oil warning system which automatically stops the engine when the oil drops below a certain level.

There's a D.C. outlet so you can conveniently recharge a battery. Large intake silencers and mufflers for exceptionally quiet operation. High-capacity fuel tank for long hours of smooth, continuous power.

These are the things that make a generator a Yamaha. In places where a generator

is often the only source of power and there's not a drop of gasoline to waste, Yamaha is the name people rely on.

The Yamaha EF1200, EF1800 and EF2600.

Portable electric power to run anything from campsite to a construction site.

See your Yamaha dealer and get all the juicy facts.

YAMAHA

When you know how they're built.

PICK OF THE PROJECTION TVs

(Continued from page 106)

cost; some sell for as little as a few hundred dollars.

In the last several months there have been two very new picture-display advances, one of which is just reaching the general market. The other may be confined to higher priced military-industrial sets and may not be enjoyed at all by the consumer (at least not in its present, expensive form).

For right now, Henry Kloss and his Kloss Video Corp. have developed a brand-new Novatron picture tube, having extra-sharp magnetic focusing, a long deflection angle, and a mirror system somewhat akin to the highly successful Schmidt optics. The beam shines through the center of an optical mirror, strikes a small, phosphor-coated center target, then is reflected around the target assembly and out through a final correction lens to the viewing screen—one tube, of course, for each color. Kloss claims a system optical speed of $f/0.7$, just about the fastest in the industry, and brightness of at least 80 foot-lamberts. A 19-inch TV measures about 150 foot-lamberts.

An unconventional system

Meanwhile, Aquabeam, the most unconventional new system of all, has been introduced by Art Tucker of Electronic Systems Products Inc. Tucker designed a four-window plastic box, mounted a pair of individual-wave-length dichroic mirrors inside, then filled the box with special liquid to defeat refractive mirror distortion. The result is a single red, blue and green beam of very high intensity that can be projected by only one lens on any suitable viewing display, the image size depending solely on distance between projector and screen. Unfortunately, startup manufacturing costs for this system are high. Consumer production units would have to sell for between \$5000 and \$7000.

Japan's Mitsubishi (MGA) is also showing a new tri-picture tube system. MGA claims a brightness level 10 to 15 times greater than that of conventional tubes and a maximum resolution of 350 lines horizontal and 400 lines vertical at 25 kilovolts.

Available now

With more than minor improvements immediately available, at least four of the newer sets are well worth consideration by anyone who has that extra buck available to invest in big-screen TV.

Kloss Video Corp. markets its Novabeam two-piece system with No-

vatron tubes at the relatively modest price of \$2495. This includes: a 6½-foot screen; 80 foot-lamberts of brightness; a Magnavox 4-MHz comb filter; very high resolution chassis; electronic random access; channel scan; remote-control tuning; a built-in test pattern generator to adjust focus and convergence; equalized power amplifier for the speaker; separate sound output; and both 300- and 75-ohm antenna inputs—an excellent buy in most respects.

There is also MGA's current VS-500U and more recent VS-505U and VS-510U models, which are just appearing in some major cities. The VS-500U has: a 50-inch (diagonal) screen of washable vinyl; $f/1.3$, four-element precision-ground glass optics; five stages of video amplification (gain) with super resolution; varactor pushbutton tuning; two 5x7-inch oval speakers capable of being switched to a 10-watt external amplifier; and 300- and 75-ohm antenna inputs. There are also video and audio input jacks, and the cabinet is vinyl-clad wood veneer—another solid buy, even at \$3700, considering this is a very deluxe set with excellent convergence and superior optics.

Another new and very presentable single-unit projection TV that's also just being introduced to the market is Advent's new VideoBeam Model VB125. Featuring a low-profile cabinet of solid hardwood and walnut veneer, this set (as do other Advents) uses: a Canadian Electro-home TV chassis to drive three 5-inch, four-element picture tubes with $f/1.3$ lenses; a five-function remote control for on/off; random access and sequential channel selection; hi-fi loudspeaker; video/audio outputs; two direct video inputs; 300- and 75-ohm antenna inputs; a 300-ohm UHF outlet; and customer controls on the lip of the cabinet mirror drawer. Price: \$4000.

All of the projection TVs we mention can be used with video-cassette decks, the new videodiscs and electronic games, as well as for normal TV fare. Many so-called "media rooms" feature a projection TV screen along one wall, with numerous accessories from the list above for an all-around home entertainment center.

Is this all? For the time being, probably yes. But by next summer, more U.S. and perhaps even foreign manufacturers may be in the market with laser-beam projection sets and 6-foot screens that will literally dazzle the eyeballs. **PM**

BE YOUR OWN BOSS!

Start a MONEY-MAKING SMALL ENGINE REPAIR BUSINESS of YOUR OWN

Earn EXTRA CASH income working at home—SPAREtime or FULLtime

Small Engine Repair Is A Wide Open Field

Over 65-Million small engines are in use today, and a million new units are being built each month. This means there's plenty of business and big profits available for qualified men who can service and repair them. Industry growth has been so fast that there is a shortage of small engine repair pros. That's why NOW is the time for you to get into this profitable field where you can command hourly rates equal to any other skilled craft. The sale of parts, engines and accessory items add even more profits... profits YOU earn and keep in YOUR pockets, not someone else's.

Start A Fulltime Business Or Work Spare Hours For Extra Cash Income

When you're the boss in a fulltime business of your own there's never a worry over strikes or layoffs, and you earn year round profits repairing chain saws, tillers, tractors, mowers, mini-bikes, power rakes, generators, snowmobiles, snowblowers and many more items. There is no huge investment for equipment, no expensive inventory. Work right out of your garage, basement or a spare room. Ideal for sparetime income too. In just evenings and weekends you can earn extra cash for a rainy-day or retirement fund, or use the extra money for the things you want NOW.

It's Easy To Learn—No Experience Needed

You can learn this craft at home in your spare hours with our time-tested "hands on" training methods. Age, education, minor handicaps are no barrier. You get latest text materials, special tools and 3½ HP Briggs & Stratton engine, but that's not all. We also help you with detailed data on how to get started, where to get business, what to charge, where to get parts at wholesale... all the shortcuts and proven methods you will need to get your business off to a fast, profitable start.

Send TODAY For FREE Facts There Is NO Obligation —NO Salesman Calls

Our FREE information kit tells how to quickly start your own business, how to grow, and how you can inspect the Foley Small Engine Repair Course on our 15-Day NO RISK Trial Offer. Mail coupon (or send postcard) to:

Foley Small Engine Repair
4681 Foley Building
Minneapolis, Minnesota 55418



YOU GET THESE QUALITY TOOLS AND INSTRUCTIONS PLUS THIS 3½ HP BRIGGS AND STRATTON ENGINE YOURS TO KEEP!



Foley Manufacturing Co.
4681 Foley Building
Minneapolis, Minn. 55418

RUSH COUPON TODAY!

☐ YES, please send FREE Data Kit and full details on how I can start a profitable Small Engine Repair business of my own, and facts about Foley's exclusive 15-Day No Risk Trial Offer. No obligation. No salesman will call on me.

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

THE FREEDOM BALLOON

(Continued from page 102)

to look for material. Since Posneck, population 20,000, has few stores and they were well known in town, they drove 30 miles to a department store in the larger city of Gera where they found a cotton cloth they thought would do the job. To allay any suspicions on the part of the clerk, who was speechless when they told her how much of it they wanted, they said they were from a camping club and wanted it as tent lining.

Sewing under cover

For the next two weeks Wetzel ensconced himself in his upstairs bedroom, always hiding everything if visitors came, to do the sewing on a 40-year-old, foot-pedal sewing machine. Working each day until his hands and feet were swollen, he produced a bag measuring 50 feet wide and 66 feet long.

Strelzyk, meanwhile, working in Wetzel's downstairs hobby shop, constructed the gondola and burner system.

His first burner rig, later to prove inadequate, consisted of two 11.8-inch-diameter, 24.2-pound, 1.45-gallon bottles of liquid propane household gas hooked by hoses to a ½-inch waterpipe with a control petcock, topped by a 4-millimeter-diameter nozzle leading into a sheet-metal stove pipe that measured 39 inches long and 5 inches in diameter.

The gondola was a 4.6 by 4.6-foot welded frame of 1.57-inch angle-irons, strengthened by two diagonally welded 1-inch iron struts. He drilled holes in the frame at 6-inch intervals to bolt in a fitted piece of sheet-metal flooring .03-inch thick. At each corner he bolted a 1-inch-square, 31.5-inch long steel post and also drilled holes in it at 6-inch intervals. Through the holes he passed 8-millimeter-thick nylon clothesline, surrounding the gondola, like the ropes in a prize-fight ring, as a

guard rail. On top of each of the four posts he welded a ½-inch open hook to which the lines (the same type of nylon clothesline material) securing the bag to the gondola (three lines per hook, 12 in all) could be secured.

By early April 1978 Strelzyk and Wetzel were ready for testing. They spent several days hunting for a safe place where they could try out the balloon, finally finding a secluded clearing in a forest about 18 miles south of Posneck and 6 miles from the border. Under cover of darkness they spread out the bag, lit the burner (whose flame was only a disappointing 1.5-foot-long), held up the opening and attempted to inflate the balloon with it. Nothing happened.

"We thought it was because the bag was lying flat on the ground and probably ought to be vertical," Wetzel remembers.

They spent several weeks hunting for a place where they could do that secretly, finally discovering an isolated rock quarry with a 75-foot cliff, from which the bag could be suspended and inflated from below. Again, nothing happened.

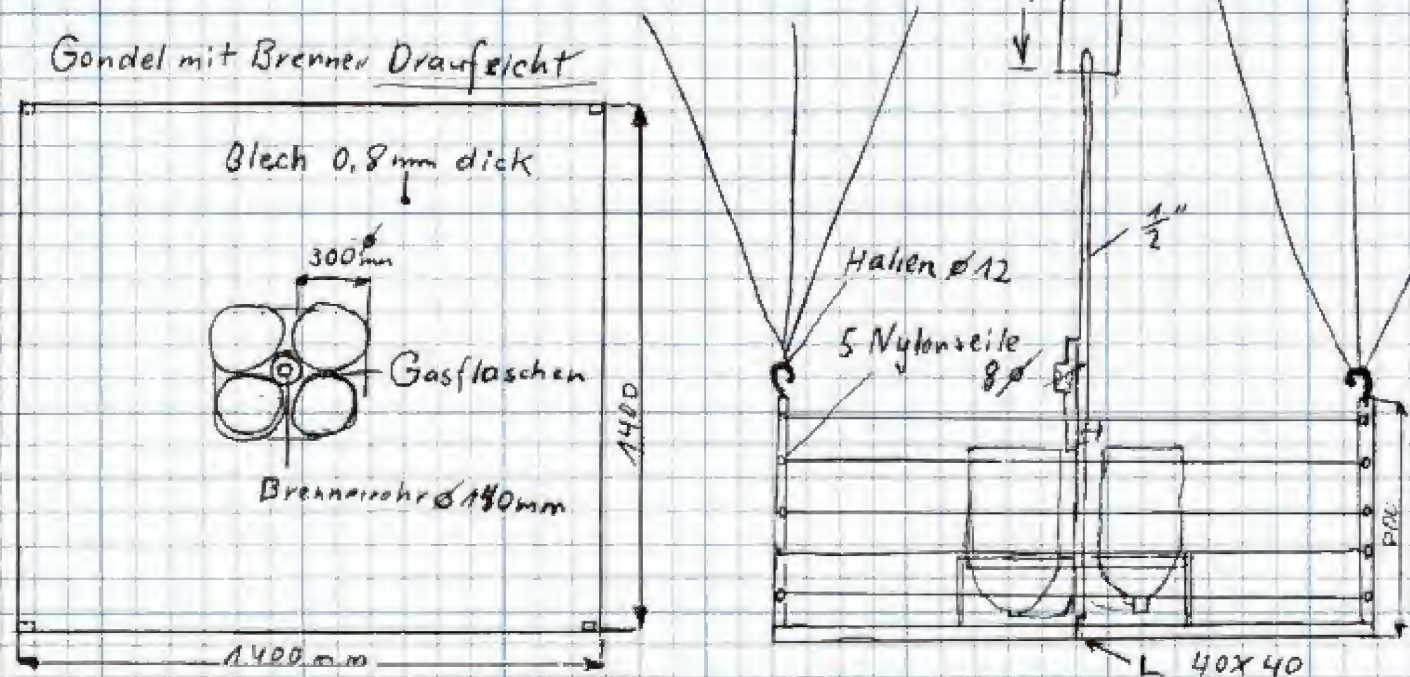
Wetzel and Strelzyk then designed and built an ingenious blower—figuring that the bag should first be filled with cold air—and a portable "flame-thrower" that would help heat it before igniting the burner on the platform.

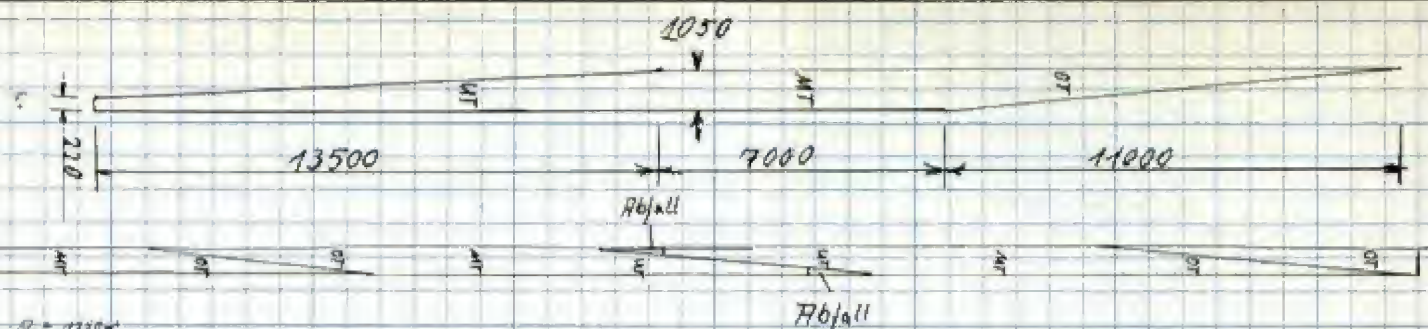
The blower consisted of a homemade fan with six blades, each about 3 feet long, powered by a 14-hp, 250 cc "Zwickauer Motorenwerke" motorcycle engine. The blades were fashioned of sheet steel. The blower had a capacity of 17,657 cu. ft. of air per minute. The engine was equipped with a starter from an East German Trabant automobile, which they could switch on by jump cable from the battery of Strelzyk's Soviet-made Moskvitch sedan. To avoid possible detection in the clearing, because of the motorcycle engine's noise, they silenced it with a Trabant muffler.

The "flame-thrower," also fed by two 11-kilogram

Strelzyk and Wetzel collaborated on these sketches exclusively for PM. Top view of gondola (Gondel) below indicates dimensions in millimeters, including sheet-metal (Blech) thickness, length of sides and diameters of gas bottles (Gasflaschen) and burner

pipe (Brennerrohr). Profile sketch (not to scale) shows 40 x 40-mm angle-iron frame, iron corner rods drilled with five holes for 8-mm nylon clothesline (Nylonseile) and hooks (Haken) on top, each with three clotheslines attached securely to the balloon.





Drawing above shows shape of individual fabric sections (top) and how careful planning allowed each section to be cut from rolls of fabric with the least waste (Abfall). Dimensions in millimeters refer to upper (OT), middle (MT) and lower (UT) segments of each piece of fabric. At widest part, each section is 1050 mm wide. At left is Strelzyk's sketch for the assembled balloon, with the surface area and the cubic contents written above.

placed the various samples over the mouth of the hose and switched the cleaner on. The denser the material, the more the suction would deflect the water in the tube. The umbrella covering proved best, but was also the most expensive. Strelzyk and Wetzel settled on one of the taffetas.

To buy it without arousing suspicion, they drove more than 100 miles to Leipzig, East Germany's second largest city, and placed their order in a big department store, this time claiming they were from a sailing club and the material was ideal for sailmaking.

"They didn't have that much in stock," Strelzyk explained, "and told us it would take a day. We were afraid that the purchase might be reported to the State Security Service, but when we went back to the store the next day, there was our taffeta; all 800 running meters of it, a meter wide, but alas, in four different bright colors. We took it, paid 4,800 marks (\$720) for it,

(Please turn to page 148)

propane gas bottles, was simply a portable version of the balloon's platform-mounted burner.

The new equipment finished, Strelzyk and Wetzel set out again one dark night for the little clearing to try once more. The results, however, were the same. The bag wouldn't inflate, but thanks to the powerful blower, the two men realized why. The material was too porous. The air rushed right through it.

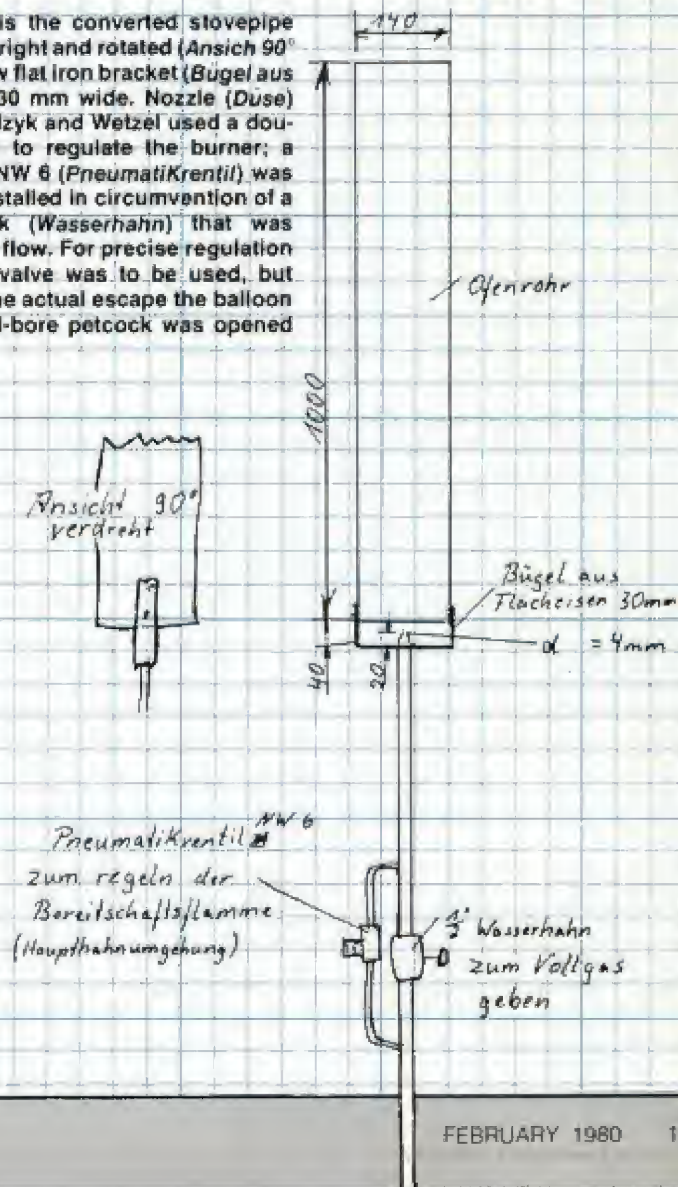
Disappointed but determined

They packed up the bag and all their equipment and headed back to Posneck, sorely disappointed, 2,400 East German marks (\$360—the cost of the material) poorer and weary for all their efforts, but determined not to give up.

First they had to destroy the evidence. Over the next few weeks Strelzyk cut up and burned the 800 square yards of balloon bag in the furnace of his house. Then they began scouting for a denser and more suitable textile. In stores in Posneck they picked up various samples: umbrella covering, several grades of synthetic taffeta, and nylon jacket lining.

They tested the materials for heat resistance by baking them at various temperatures in the oven of a kitchen range. To determine density they devised a simple but clever system: They drilled a quarter-inch hole in the side of the plastic suction hose of a floor-type vacuum cleaner, inserted a U-shaped tube of glass into it so that it would be air-tight. They painted markings on the glass and filled it partly with water. Then they

Balloon's powerplant is the converted stovepipe (Ofenrohr) sketched at right and rotated (Ansicht 90° verdreht) below to show flat iron bracket (Bügel aus Flacheisen), which is 30 mm wide. Nozzle (Düse) diameter is 4 mm. Strelzyk and Wetzel used a double-valve arrangement to regulate the burner; a pneumatic valve type NW 6 (Pneumatikventil) was the primary control, installed in circumvention of a ½-inch water petcock (Wasserhahn) that was opened to give full gas flow. For precise regulation during flight, smaller valve was to be used, but soon after takeoff on the actual escape the balloon top ripped and the full-bore petcock was opened until the gas ran out.



THE FREEDOM BALLOON

(Continued from page 147)

and then dashed back to Pösneck."

Wetzel meanwhile had attached an electric motor to his wife's aged sewing machine and within a week had the new bag, identical in its 15-by 20-meter dimensions to the old one, ready.

The two men drove back to the little clearing with all their gear late the next night, made their preparations, spread out the balloon on the ground, started the blower, ignited the "flame-thrower," and within five minutes or so the bag was nearly full, standing tall, and the air stayed in it. But Strelzyk's burner was too weak and gave it too little lifting power.

By now it was almost winter, too late and too cold to make a flight, even if the balloon would rise. Strelzyk and Wetzel spent the last months of 1978 trying to devise a more powerful burner. They added two more 11-kilogram propane gas bottles, they experimented with gasoline and with gasoline-propane mixtures. But the results were still unsatisfactory. Four people might make it, and then only with luck, but never eight.

That was one reason why Wetzel decided at the time to back out. Another was that he had started building a large model airplane with a gasoline motor and began toying with the idea—far-fetched, as he now concedes—of constructing a large enough version in which he, Petra and their two small children could flee.

Thus Strelzyk tinkered on alone, still dissatisfied with the burner and its lifting power. Then suddenly, in June, 1979, came the break. He was trying to empty a half-full propane tank in his garden by holding it upside down. When he opened the spigot the gas shot out in a huge cloud.

"The pressure with the bottles held upside down, I figured, ought to give me the flame length and burning propensity I wanted—24,000 kilocalories per 1 cubic meter of gas," he explained, adding that 1 cubic meter of gasified propane is equal to 1 liter or 2 kilograms in liquid form.

He quickly made alterations on the gondola to provide an angle-iron rack in the middle of it, on which he could mount four propane tanks upside down and, together with his elder son, headed once again for the forest to test the burner. On ignition, a 40-foot flame shot out of the stove pipe. Sixteen months after they had just gotten the idea, the balloon was ready and the Strelzyks

began waiting for the right weather and wind conditions.

Aloft on Independence Day

Both came on the night of July 3. The family headed with balloon to the clearing and at 1:30 a.m. on July 4, lifted off, rising at 13 feet per second to an altitude of 6,600 feet—according to the barometer which Strelzyk had converted into an altimeter.

The northerly wind blowing them toward West Germany was good—almost 20 miles per hour. But then disaster struck. They entered a cloud. The vapor condensed into water on the balloon's surface, soaked the material and made it heavier and heavier.

"Before I really realized what was happening," Strelzyk recalled, "and before I had the presence of mind to increase the gas flow, we were sinking too fast."

They came down safely but still in East Germany a scant 200 yards from the border and freedom. They were right in the "death strip" and within sight of the wire-mesh fence that, as they now know, bristles with tripwire-triggered shrapnel guns.

The tale of how they spent the next nine hours gingerly picking their way out of the 500-meter-wide border area with its hidden tripwires, and out of the three-mile-wide restricted area behind it without being seen, caught or shot by border patrols, is a harrowing one. But they made it to the clearing where they had abandoned their car with trailer, the blower, the auxiliary flame-thrower, and the lines and spikes that had held the balloon until lift-off. The balloon and gondola, of course, remained as glaring evidence of their escape attempt, right where it had landed in the death strip. According to reliable West German border police sources, it was discovered that same morning.

The hunt for the balloon escapees was on and Strelzyk became panicky.

He destroyed all evidence—the blower, the flame-thrower and even his calculations. Fearing that they might have been seen that day in their unmistakable orange Moskvitch, he sold the car and bought a used East German-made Wartburg. He also tried to make contact with Western embassies in East Berlin in the hope of finding a diplomat who might hide them in a car or truck and drive them to West Berlin.

"I knew it was just a matter of time before the search would close in, not only on us but the Wetzels," he explained. "I went to him, told him what had happened and he

agreed our only hope was to build another, bigger, better balloon that would take all eight of us out—and to build it faster than the plodding, bureaucratic secret police apparatus would expect us to."

Back together once more

This time, working together again, they designed a bag with twice the volume—141,256 cu. ft., measuring 65.6 feet in diameter, and 82 feet in height, and requiring 13,453 sq. ft. of material. To find the material they drove more than 2000 miles crisscross all over East Germany, buying small amounts here, small amounts there, aware that any large order anywhere would alert the police. What they ultimately came up with looked like a rainbow-colored patchwork quilt of synthetic textiles, some of them patterned and flowered and intended as bedding. They even bought the clothesline needed in different towns.

Wetzel went back to his creaky sewing machine, after cutting the wild array of material first into equal widths of 3.3 feet, and then wedge-shaped pieces 103.3 feet long. Strelzyk built a new blower, flame-thrower, gondola and burner, to the exact same specifications of those he had abandoned in the border death strip or dumped in a panic after that harrowing mishap. Within only six weeks they were ready to go again.

The new balloon bag weighed 403 pounds together with its clothesline. The gondola, burner, propane bottles and the two families of four came to another 1209 pounds. Total weight to be lifted: 1612 pounds.

"But I knew that with the new bag's volume we would have plenty of reserve," Strelzyk says. He knows the calculations by heart and did them for me.

"At the normal density of air, at 0° C., 4000 cubic meters of air has a weight of 5172 kilograms. At 100° C., the air density is only 3785.4 kilograms on a volume of 4000 cu. meters. Thus, the density difference between the cold and the heated air is 1386.6 kilograms. That was my lifting power. Subtract the 733 kilograms of the bag, gondola and passengers, and we had a reserve lift-power of 653.6 kilograms."

Skyward for good

All they needed was the right wind and weather again. It came on the evening of Sept. 15. Wasting no time on tests but certain that it would work, the two families, with only the clothes on their backs, packed their balloon and equipment into the trailer hitched to Strelzyk's

(Please turn to page 150)

When your taste grows up, Winston out-tastes them all.

Only Winston's Sun-Rich™ Blend
of the choicest, richest tobaccos
tastes this full and satisfying.

Winston after Winston.

BOX: 19 mg. "tar", 1.3 mg. nicotine, KING: 20 mg. "tar",
1.3 mg. nicotine, av. per cigarette, FTC Report MAY '78.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.



LYNCHBURG

HARDWARE & GENERAL STORE

Box 342, Lynchburg, Tenn. 37352



Old-time Riverboat Playing Cards

Both of these decks are prettier than a painting, and so is the antique tin card case. Each card is a bit larger and thicker than normal—like those used on riverboats in the 1890's. There's a black and a green deck—both with an antique gold "distillery design." The face cards are reproduced from 100-year-old artwork. So it's a real unusual set of cards for the serious player. Twin deck in antique case: \$8.50. Postage included.

Send check, money order, or use American Express, Visa or Master Charge, including all numbers and signature.

(Tennessee residents add 6% sales tax.)
For a color catalog full of old Tennessee items, send \$1.00 to above address.

MOLDS

for making
Ornamental Concrete
Items...

Book about Aluminum
Molds with prices and
production trade secrets
direct from world's largest
mold manufacturer.



SEND
\$5.00

CONCRETE MACHINERY COMPANY, INC.

P. O. BOX 499 - HICKORY, N. C. 28601



"SAVE
YOUR
HEART"

with a **STAIR-GLIDE**® Stairway Lift
RENTAL-PURCHASE Program Available

America's largest selling stairway lift. Ideal for people who cannot or should not climb stairs. Easily installed in less than 2 hours without damaging stairway. Runs off household current. Choose from Deluxe or Economy models.

AMERICAN STAIR-GLIDE® CORP.

4001 East 138th, Dept. POP-020
Grandview, Missouri 64030

THE FREEDOM BALLOON

(Continued from page 148)

recently-purchased Wartburg car. Wetzel and young Frank got on a motorbike, the women and children into the car, and they headed for their "launch pad to freedom"—the same little clearing in the forest.

It was 1:30 a.m. Sunday, Sept. 16, by the time they arrived and started setting up. The gondola was secured with ropes and spikes in the ground, the bag spread out. Wetzel and Frank held up its 10-foot diameter opening. Strelzyk turned on the blower. In just 10 minutes it was full. In another three minutes the air within it was heated, and the burner blazing. Shortly after 2:00 a.m. they lifted off, taking only nine minutes to attain an altitude of more than 6,500 feet, and moving at 18 miles per hour toward West Germany again. The air temperature at that altitude was 18° F. The women and children huddled, shivering, on the gondola floor around the four propane bottles, which took up 40 percent of the floor space. The only protection against falling was the clothesline guard rail.

As short and ultimately successful as the 28-minute flight was, it was not without mishap and near disaster. The meter-long stovepipe of the burner, Wetzel and Strelzyk later calculated, was about 10 percent too long, with the result that the flame was too high and pressure too great inside the bag.

Shortly after takeoff, and still well within East Germany, a rip appeared in the top of the bag. The gush of air out of it extinguished the burner and Wetzel began frantically trying to rekindle it with a pack of matches brand-named, ironically, *Freie Welt*—Free World. It ignited, only to go out several more times.

Just before crossing the border, they later realized, their strangely illuminated conveyance must have been spotted in the night sky by East German patrols. Searchlights were trained on them from the ground but were probably not powerful enough to make them completely visible. Just to be on the safe side, Strelzyk turned the petcock to full, the flame reached a frightening length of more than 50 feet inside the bag, and the balloon rose by another 1,640 feet to its maximum altitude of 8,202 feet.

"I didn't know whether the altimeter I had fashioned was accurate," Strelzyk said, "but West German air controllers later told me that they were getting radar blips... at that time from something they couldn't identify. That was us."

Soon the gas ran out and they came down, fast and hard, near Naila, 460 feet from high-voltage wires.

Wetzel, who broke his leg in the landing and was the only casualty, estimates the kilocalorie output of the burner at 480,000 to 500,000 during the brief ride, and believes that "we could have made it as far as Bayreuth (30 miles further southwest) had not the top blown out and made us consume so much gas."

Now much celebrated and trying to settle down in Naila, where they intend to live, when I interviewed them, the Wetzels and Strelzyks still could neither quite believe their good fortune nor face squarely the risks they had taken.

But they were sure of two things.

They want to register their balloon in West Germany, join a club and go ballooning again—"for fun and in daytime when you can see something." They were also sure, sadly, that no one in East Germany would be likely to duplicate their escape for a long, long time. Border patrols are now even more watchful.

Indeed, within a day of the successful flight, all small airports close to the border in East Germany were closed, the planes transported further inland. Along a broad 18-mile band, from Lübeck on the Baltic Sea to Hof, near Naila, and where East Germany's border meets Czechoslovakia, security tightened.

"No one," conjectured a Bavarian official, "will ever again be able to buy enough materials in East Germany with which to make a balloon—even by shopping every department store in the country." **PM**

BEATING THE BORDER

(Continued from page 103)

Four East Germans once passed through Berlin's "Checkpoint Charlie" wearing home-made Russian officers' uniforms and driving a Soviet-make car which they had painted regulation olive green. The East German guards actually saluted them as they left.

One East Berliner even managed to escape backward. A professional photographer, he hired several beautiful girls as models, took them to "Checkpoint Charlie" and told border officials he was on assignment from an East German magazine to take publicity pictures of the frontier arrangements, which are ballyhooed by Eastern propaganda as a "defensive measure against capitalist-imperialism." He asked several of the guards to pose with the girls and, with his back to West Berlin, began taking scores of pictures, moving one or two steps backward—closer to freedom—with each shot until he was standing on the white demarcation line. He then turned and bolted into the arms of American MPs, who had been watching his antics with great amusement.—**J.D.**

Start your own money making business!

Make up to \$12⁵⁰ an hour—
even while learning!

Train FAST
at home!

Get into this booming high-profit business that's
Easy to learn—Easy to do—Easy on You!

Never before have money-making opportunities been so great for qualified Locksmiths. Now lucrative regular lock and key business has multiplied a thousandfold as millions seek more protection against zooming crime. Yet there's only one Locksmith for every 17,000 people!

Start Collecting CASH PROFITS Right Away

You're "in business" ready to earn up to \$12.50 an hour a few days after you begin Belsaw's shortcut training. Take advantage of today's unprecedented opportunities in Locksmithing for year-round EXTRA INCOME in-spacetime—or fulltime in a high-profit business of your own. Hundreds we've trained have done it. So can YOU! All tools plus professional Key Machine given you with course. These plus practice materials and equipment, plus simple, illustrated lessons, plus expert supervision, plus business-building guidance will enable you to KEEP THE MONEY COMING IN! Ideal for retirement—good jobs too.

SEND FOR EXCITING FACTS—No Obligation

Discover what's in Locksmithing for you—how Belsaw's Master-Locksmith-approved training can give you the skill you can depend on to EARN MORE—ENJOY LIFE MORE.

No Extra Cost! Included With Your Locksmith Training



BURGLAR ALARM and SECURITY SYSTEMS training. Covers all phases of Burglar, Hold-Up and Fire Alarm servicing and installation. This valuable and timely instruction includes all special tools and supplies. ONLY Belsaw offers such extensive training in this rapidly expanding field as a part of your Locksmith training.

ADVANCED Locksmithing! How to change combinations, in stall and service Safe, Vault and Bank Safe-Deposit Box locks. You learn-by-doing on the locks that we supply. You'll find it fascinating and highly profitable work.

Be
Your
Own
Boss!



BE A LOCKSMITH!

"I began earning right after starting... made \$1,200 while I was still learning."

HARVEY COLE Charlevoix, MI 49720



10-DAY
NO RISK
TRIAL!

Send for details!

THIS PRO KEY MACHINE IS
YOURS TO KEEP!



This Pro Key Machine can alone add up to \$200 a month to your income... and it won't cost you a penny extra with your training.

ALL SPECIAL TOOLS AND EQUIPMENT INCLUDED!



Find out all about it! Send for **FREE** Facts TODAY!

Just fill in and mail coupon below (or send postcard) to receive full information and details by return mail. **DO IT TODAY!**

RUSH COUPON!

BELSAW INSTITUTE

100F Field Bldg., Kansas City, Mo. 64111

Hundreds of Belsaw trained men have succeeded in this fascinating and highly profitable field...

"I opened my own business, spare time, seven months after I enrolled and made a profit of \$329 for the first week."

B. A. Deberry Littleton, Colorado



"No more hard, nasty work for me. Now I have my own business and with hardly any effort I average around \$50 a day. Thanks for my new start in life."

Sam Walker Prichard, Alabama

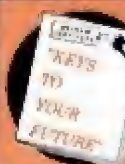


There is **NO OBLIGATION** and **NO SALESMAN** Will Call—ever!

RUSH COUPON TODAY
FOR THIS FACT-FILLED

FREE BOOKLET!

Tells how you quickly train to be your own boss in a profitable Sparetime or Fulltime business of your own **PLUS** complete details on our **10-Day NO RISK Trial Offer!**



Send for your copy today!

BELSAW INSTITUTE, 100F FIELD BUILDING
KANSAS CITY, MISSOURI 64111

YES, please send me the **FREE** booklet that gives full details about starting my own business in Locksmithing. I understand there is no obligation and that no salesman will call.

Name _____

Address _____

City _____

State _____

Zip _____

... YOU Can Do It Too!

SEE YOUR DEALER TODAY

DEMAND THE ORIGINAL **'Firestik'**

"THE FUEL-SEEKER"

**DON'T TAKE NO FOR AN ANSWER!!
THE #1 WIRE-WOUND AND MOST
COPIED ANTENNA IN THE WORLD!**

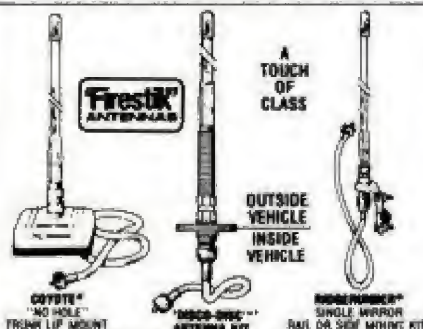
Rugged, Shatterproof Fiberglass . . .

CB

Antennas and accessories for marine, RV,
truck, auto, van and motorcycles, etc.
Also Marine, 2 Meter and Land Mobile Antennas.

Five Colors:

Spun Gold, Silver-Gray, Black, Red and White.



SEND FOR FREE CATALOG

'Firestik' Antenna Company
2614 East Adams/Phoenix, AZ 85034

Name _____

Street _____

City _____

State _____ Zip _____

Our 17th Year Serving
the CB & Communications Market

5-YEAR REPLACEMENT WARRANTY

DO-IT-YOURSELF **FINE GRANDFATHER** **CLOCK KITS**

STARTING UNDER

\$220

(Including movement
and dial)

- Factory direct prices
- Heirloom quality
- Solid 3/4" hardwoods: black walnut, cherry, mahogany, oak
- Easy to assemble, parts pre-cut
- Solid brass West German chiming movements
- Money back guarantee
- Prompt shipment

MASTER CHARGE and
BANKAMERICARD/VISA
ACCEPTED

**Write for FREE
color catalog**



EMPEROR®
CLOCK COMPANY
WORLD'S LARGEST MANUFACTURER
OF GRANDFATHER CLOCKS

Dept. 335, Emperor Industrial Park
Fairhope, Alabama 36532

BUILD A GIANT-SCREEN TV (Continued from page 107)

ments. This design allows the lens to "see" images that measure up to 17 inches wide.

Other lens designs are available, such as aerial camera lenses and plastic Fresnel lenses. The latter lenses tend to project an image of

rather inferior quality. Most lenses used for projection TV have focal lengths of about 12 inches, and this will be considered standard for our uses.

What about lens speed and focal ratios? The focal ratio is the lens's

. . . And here's a kit

If you already own a 13-inch color TV, there is a kit available to turn it into the heart of a one-piece projection TV. The kit is called the KD50 and retails for \$350 from VSR Sales (433 Airport Blvd., Suite 419, Burlingame, Calif. 94010).

The KD50 will not perform as well as one of the \$2000 units with three-lens optics, but it does offer a relatively inexpensive route to big-screen TV. It uses a plastic Fresnel lens to project the image from your TV set onto the big screen. The picture is

This one-lens system from VSR Sales is a kit—all you add is a 13-inch color TV. It uses a Fresnel lens and we found it to be acceptable.



TV must be set exactly within cabinet or you'll see distorted picture.

best viewed in a room with very muted lighting, and it does lack some of the resolution of the more expensive units.

Still, we found the performance to be adequate for casual viewing. If you're looking for a way to watch a movie or a football game on a big screen, the KD50 might be a way to go.

Assembly was very easy. It took us less than five hours to progress from three large boxes to the finished unit. Construction was aided by the evident attention to prefabrication paid by the manufacturer. Every tab and hole matched its mate perfectly!

It will be necessary to modify the TV used in conjunction with the KD50 system. Wires to the verticle deflection yoke must be reversed so that the image on the TV appears both upside down and as a mirror image.



Closing cabinet gives neat appearance, blending with room's decor.

The projection system rights it via the plastic lens. Don't forget to do this and, if you don't feel at home working on a TV set, almost any qualified technician should do it for a small fee.

Don't bump the cabinet

Alignment proved critical. The 13-inch TV set (that you supply) must be exactly positioned in the cabinet. The slightest bit off results in a partially defocused picture. As the TV just sits in the cabinet, once it is aligned, try to keep people from bumping into the unit or—as happened to us—you'll have to do it all again.

All in all, the KD50 seems a good buy and VSR Sales told us they'll offer a money-back guarantee to readers of *Popular Mechanics*.—Neil Shapiro

focal length divided by its aperture. This ratio gives the relative speed of the lens, and is usually used to compare how bright one lens will project an image as opposed to another lens. *Lower focal ratios let more light pass through the lens and increase brightness.* This can be deceiving, however, because some lenses that pass a lot of light may lack sharpness or contrast, which are also important factors to consider.

Do not be misled by claims of brightness. Generally, you can follow these simple rules: 1. Glass lenses provide the sharpest images, but must be viewed under low room light. 2. Plastic lenses of the three-element design produce brighter images, but lack sharpness and contrast. 3. Plastic Fresnel (pronounced Fray-nel) lenses produce very bright images, but lack definition and contrast except the Z element used by Schudel with a lens speed of f/1.6.

Projection screens

Without the proper projection screen, you won't see an image bright enough for long periods of viewing. Your eyes require a certain level of brightness to avoid eye-strain. Except for the three-tube projection systems, few commercial giant TVs have met the required standards. You can get close to these standards if you follow our instructions.

To increase brightness, a special screen can be used. This screen is usually molded into a spherical shape and covered with highly reflective aluminum foil. When light is projected on this screen, it is reflected back to the audience in a cone of light known as the viewing angle.

Which lenses and screens?

Refer to the list of manufacturers at the end of this article. All these companies make quality products, and the selection of a lens/screen combination really is dependent on just how the final TV system will be used.

For maximum brightness and audience viewing angle, the f/1.9 lens from U.S. Precision Optics and the 4-foot screen from Siva Products are the best combination.

For a combination of maximum sharpness and contrast, a glass lens and the Schudel screen are recommended.

How to calculate distances

You can use a solid-state portable TV with a picture tube diagonal of 12 to 17 inches. With this TV and a cardboard cone to hold the projec-

tion lens, you can make a simple but adequate giant-screen TV projector.

To calculate the proper distances between TV tube, lens and screen, use the following formulas:

$$C = \frac{A}{B} \quad D = C \times 12' + 12'$$

$$E = \frac{D}{C}$$

A = diagonal of projection screen, in inches.

B = diagonal of TV picture tube, in inches.

C = ratio of the above (A divided by B).

D = distance from focal point of lens to screen, in inches.

E = distance from focal point of lens to TV picture tube, in inches.

These formulas will work 90 percent of the time. They work best with small-diameter (3-inch) lenses. Bigger lenses will blow up the image in a shorter distance.

Adapting the TV

If you project an image using an ordinary TV, you will see the picture upside down and backward. To obtain the correct image, you'll have to flip and reverse the TV picture electronically. This can be done easily by reversing the wire leads going to the vertical deflection yoke at the rear of the TV picture tube. You must refer to the schematic of the set or consult a local TV service shop for help. To avoid shock, *observe the proper precautions* when working around the picture tube.

Making the projection cabinet

The cabinet to hold the TV and lens need not be elaborate to work properly. A cardboard cone taped over the front of the TV picture tube will provide as good a picture as a cone made out of solid oak.

For good results, the lens should be mounted perpendicular to the picture tube and in line with its center. If the lens is slightly out of alignment, proper focusing of the final projected image cannot be achieved. This is especially critical when you are using large-diameter lenses.

Note that distance E in the formula is from the focal point of the lens, which is somewhere in the middle of the lens barrel. If the retaining ring for the lens is placed at this point, proper focusing should be achieved without having the lens fall out.

Illustrated here (page 107) is a simple cardboard cone made for a

(Please turn to page 154)

WOODWORKERS Do-it-Yourself CATALOG

with **20**
WOOD
SAMPLES



104 giant pages
—finest veneers,
cabinet & furniture
woods, carving blocks, inlays, period hardware,
carved moldings, pic. framing. Sliding, revolving
hdwe. Coffee mill kit. Wood finishes, cane,
lamp parts. Marquetry kits. Specialty wood-
working tools. Over 2,000 hard-to-find practical
products. Woodworking books and plans.

TEAR OUT AD. MAIL TODAY.

CONSTANTINE Est. 1812

2051 Eastchester Road, Bronx N.Y. 10461

☐ Enclosed \$1 for Woodworkers Catalog with 20 samples of beautiful veneers. All identified. Helpful when buying woods.

Dollar refunded on first order.

☐ Enclosed 50c for catalog without samples.

☐ ALSO enclosed \$1.95. Send practical instruction manual—"Creative Veneer Craft." How to create decorative veneer designs. Techniques, patterns, projects. It's the perfect supplement to Constantine's big Catalog.

New York State residents please add tax on \$1.95

Name _____

Address _____

Zip _____

SAVE YOUR FLOORS

Easy-to-install, long-lasting Shepherd Casters with resilient wheels make all kinds of household furniture and appliances easy to move without scratching or denting hardwood and tile floors.

For quality casters in a variety of styles and sizes, look for the Shepherd name wherever hardware is sold.

Insist on the best

shepherd
casters





**Who Says Ours Are The Best?
YOU Do.**

Year after year, you tool users buy more CHANNELLOCK tongue and groove pliers than any of the imitator brands. By far, it's your way of telling us that CHANNELLOCK, the original, the first of its kind, is best of its kind. Thank you. We're going to keep it that way.

CHANNELLOCK, INC. • Meadville, Pennsylvania 15335

CHAN NEL LOCK

Meet the Rest of the Family. Send For Free Catalog.

Don't get caught next year without a Thermograte® wood heating appliance!

If you wanted a Thermograte® Fireplace Furnace insert or Fireplace/Stove this year . . . but were disappointed because there weren't enough to go around . . . don't wait 'til it's too late again!

IT WORKS!
Cool air in tubes is heated, expands and rises. Heated air flows into your home . . . naturally!

Order now. We'll guarantee delivery by Oct. 1, 1980. 6-month trial & 12-month "no interest" terms.

SATISFACTION GUARANTEED!

For FREE information, write:
Thermograte Ent., Inc. Dept. 840-002
P.O. Box 43021 St. Paul, MN 55164
Or CALL TOLL FREE: 1-800-328-0882

© 1980 TEI ST. PAUL, MN 55113. ALL RIGHTS RESERVED.

BUILD A GIANT-SCREEN TV

(Continued from page 153)

typical 15-inch TV set. The actual picture tube size is 9 by 12 inches. The cone is made slightly larger so it can be taped to the lip that protrudes from the face of the TV set. You'll have to adapt the cone according to your set. Once you get the cardboard cone to work properly, you may want to remake it out of wood to obtain a more professional look.

The completed projector arrangement can be mounted on a piece of plywood for more stability or built into a wooden box to match the room furniture.

Using the projection screen

The screen can be mounted easily on the wall by using ordinary shelf brackets. It can then be removed and stored when not in use. For maximum enjoyment, the projector should be located at a level just below screen-viewing height. If the projector is tilted at too great an angle, distortion of the projected image will result.

You should be certain to use a screen that has been designed especially for projection TV.

Projection TV screens are curved, as opposed to flat, movie-style screens. As shown in the diagram on page 107, the curvature of the screen helps to "concentrate" the light into an image that appears brighter to the viewer.

Do not skimp on the screen—a most important part of the system.

The screen should be tilted at an angle that reflects the brightest image to the audience viewing area. Remember that the screen works like a mirror. If light strikes it at an angle, the light will be reflected at an equal opposing angle. **FM**

MANUFACTURERS LIST

Buhl Optical, 1009 Beach Ave., Pittsburgh, Pa. 15233, manufactures small f13 and larger f12.8 lenses. Prices range from \$125 to \$180; lenses are sharp and work best with Schudel screen.

Optical Science Group, 24 Tiberon St., San Rafael, Calif. 94901, manufactures plastic Fresnel lenses, mostly as proprietary products for other companies. Prices range from \$40 to \$140; lenses are good for economical systems.

Schudel & Associates, 6973 Consolidated Way, San Diego, Calif. 92121, makes high-quality, very bright 50- and 66-inch (diagonal) screens that work best with glass lenses. Prices: about \$100 for 50-inch, \$250 for 66-inch. Other screens from 50 inches to 7 feet are available from \$80 to \$250; company also sells lenses.

U.S. Precision Optics, 3997 McManis Rd., Cincinnati, Ohio 45245, makes a large, 6½-inch, three-element plastic lens (Beta II), which projects bright images of average sharpness and contrast. Lens works best with Siva screens; price is about \$135.

For more information about building giant-screen TVs from kits, write to the following: Edmund Scientific, 101 East Gloucester Pike, Barrington, N.J. 08607; Extron, 8831 Sunset Blvd., West Hollywood, Calif. 90069; and Televue Optics, 15 Green Hill Lane, Spring Valley, N.Y. 10977. They offer various kits, lenses, screens and information about systems that use special mirrors and other hardware.

YOUR QUICK WAY TO EASY MONEY!

VIP
VINYL
INDUSTRIAL
PRODUCTS

VINYL REPAIR

GIVE "on-the-spot" SAME DAY SERVICE
GET "on-the-spot" SAME DAY PAY!!!

You can be in business IN A FEW DAYS!

Sensational! That's the **MONEYMAKING POWER** of VIP Professional Vinyl Repair . . . the business of your own that can be part or full time for **QUICK AND GROWING PROFITS!** You need no study — no training — just a few hours' practice and you're ready to do repairs for pay, — **BIG PAY!** You can be in business practically overnight.

Start for less than you make in 1 hour on first job!

With just a small down payment, you get the complete VIP going-into-business kit . . . all equipment, materials, complete step-by-step instructions, business-building helps . . . everything you need!

\$513⁰⁰
in first 10 days!

The first 10 days I made \$513. Now getting business from 25 car dealers, 6 furniture stores, 4 restaurants, and bars, and clothing stores.
H. Winkley, Wash.

"Wherever I see vinyl, I can do business"



"I've made as much as \$60 in 3 hours."
C. Herrera, Jr., Ariz.

9 HOLIDAY INNS FOR HUSBAND/WIFE TEAM

"These Inns have put us on a monthly allotment. We are busy every day. Wonderful to be one's own boss. We are putting on one repairman to handle business other than Holiday Inns. With our setup, we have weekly checks coming from just the Inns."
Mr. & Mrs. Bechtel, Ohio

STEADY WORK FOR 20 CAR DEALERS



"20 car dealers give me all their repair work. I call on two or three every day, take care of what's needed. No matter what the repair is, it's easy to do with VIP."
R. Lanning, Ky.



\$440 IN 9 HOURS!

"I repaired 55 chairs at the NCO Club at \$8 each — \$440 for 9 hours' work. Materials and transportation cost only \$35!"
D. Gagnon, S.C.

HERE'S THE VIP VINYL REPAIR KIT that puts you in your own **HIGH-PROFIT BUSINESS**

They all started by mailing a coupon like this. YOU CAN TOO!

ALL FACTS FREE BY MAIL — NO SALESMAN WILL CALL. MAIL COUPON NOW

MAKE \$20 TO \$30 FOR AN HOUR'S JOB LIKE THIS



UNLIMITED CUSTOMERS FOR YOUR SERVICE

Auto dealers, car shops, restaurants, motels, bars, clubs, hospitals, bus companies . . . these are just a few of the places that need vinyl repairs, repeatedly. The business is there, waiting for you. And a repair job that takes 1/2 an hour to an hour can mean a quick \$15 to \$30 for you . . . most of it **PURE PROFIT!**

MEN, WOMEN, HUSBAND/WIFE TEAMS FIND VIP QUICK, CLEAN, EASY, PROFITABLE!

Both women and men enjoy this easy, profitable way to make good money fast and steady. The VIP exclusive process is so easy, the directions so simple, that anyone who can read plain English can do it. And what a money-maker! A sure way to have an independent income, or build to a business as big as you want to make it. There's no end to the demand!

GET ALL INFORMATION FREE BY MAIL. NO SALESMAN WILL EVER CALL.

MAIL THE COUPON BELOW OR PHONE TOLL FREE 800-621-5809
In Illinois 800-972-5858



VINYL INDUSTRIAL PRODUCTS
2021 Montrose Ave., Dept. 181
Chicago, Ill. 60618

Vinyl Industrial Products, Dept. 181
2021 Montrose, Chicago, Ill. 60618

PLEASE RUSH BY MAIL FREE FACTS about VIP Vinyl Repair and how I can start making money within a few days! No salesman is to call. I am under no obligation.

Print Name _____
Print Address _____
Print City/State/Zip _____

DRIVING THE 1980 HONDA CIVIC

(Continued from page 109)

a five-speed, the DX is priced at \$4599.

The Civic 1500 GL five-speed represents the top of the line—a sportier version of the hatchback, with (among many other standard goodies) tach, steel-belted radials, quartz digital clock, rear wiper/washer and upgraded trim, all for \$4949.

The five-door Civic wagon has the 1500-cc engine and a five-speed transmission as standard for \$4849. Two-speed Hondamatic is optional

on the 1500 DX and the wagon for \$150.

All 1500-cc Civics use a small catalytic converter this year, which means they do need unleaded fuel—something previous Civic owners happily lived without. On the plus side, though, the 1500 engine delivers not only dramatically better performance than last year's non-catalyst version, but its gas mileage is EPA-rated higher: an estimated 36 mpg city for 1980 versus 33 for 1979. California cars, like the one we drove from Los Angeles to New York City, are rated at 32 mpg city, up 4

mpg from their EPA rating in 1979.

Driving impressions

I liked the old car, but this new one is definitely better. I drove a DX five-speed recently and found a lot to appreciate.

The 1500's performance comes through as the car's most noticeable change. The previous Civic had a good deal of punch—at least with a manual gearbox. But this one's got a lot more snap off the line and plenty of power for passing. Third gear is good to an easy 75 mph, and the engine gets stronger as rpm goes up.

Because of its size, the Civic scoots into parking spaces you wouldn't even look at with most cars. I found the rack-and-pinion steering light and manageable—3.3 turns lock to lock. There's a slight amount of torque steer toward the left on hard acceleration, but it's not bothersome.

Upright, firm seats have adjustable backrests that let them suit most drivers. If you're over six feet, though, you'll find headroom and legroom a little tight. Yet the back seat has been civilized and is now quite acceptable.

The DX has an open steering wheel that leaves the instruments easy to see. Other Civic models use a four-spoke wheel that tends to block the lower portion of the instrument pod.

The five-speed is fun to use, but the stick tends to be a tad wobbly, and I'd like the detent spring for fifth and reverse to be a little less forceful. It takes a definite effort to sink those two gears.

A quiet ride, overall

Out on the highway, the Civic feels solid and glides along in relative silence. Honda engineers have managed to quiet the car in all details but two. I found the Japanese Goodrich polyester tires noisier than necessary, and the five-speed tends to emit a soft whine in its top gears—a fact made more noticeable by the hush of the rest of the car.

The wagon uses a rigid rear axle and leaf springs, but other Civics share a modified MacPherson independent rear-suspension system. Overall riding qualities are excellent. The Civic doesn't feel choppy despite its very short wheelbase.

Like other Hondas, the Civic comes with a vast assortment of nice touches and unexpected extras.

An assortment of sound systems is available, and the Civic's optional airconditioner fits into the normal vents. It's a car that once again proves that good things come in small packages.

FM

Men-Women! Make Money In Your Own Home Business!

"I STARTED WITH \$100 AND MADE MILLIONS IN MAIL ORDER"

You can make a Mail Order Fortune much easier today. I want to help you but: If you are looking for a get-rich-quick-scheme... please turn the page. I did not get rich overnight. But I can tell you that within a short time in mail order I was making more money than any of my friends. The millions came later... and I owe every penny of it to mail order! If you are ambitious and willing to follow directions... I will help you get started on your way to mail order success!

YOUR HOME MAIL ORDER BUSINESS

Just a few hours a week part time at the start! Then branch out into full time! Keep present income while adding welcome "second income." Use Mail Order profits for travel, savings, education, retirement. It's up to you. I learned long ago the success secret in Mail Order is picking the right product. I reveal in my Free Course 3 tests your product must pass to be a Mail Order winner! I'll show how to make up simple little ads that bring in orders and cash. Everything I tell you is based on my own success. I know it works.

BUY BELOW WHOLESALE FOR BIGGEST PROFITS

Imports are great for Mail Order. I travel the world searching out new imports you can turn into quick profits. Start with 24,221 best selling imports. Deal in one or many. Buy Below Wholesale direct from overseas supplier. You keep all the profit. I will also

ACTUAL REPORTS OF MAIL ORDER MONEY MAKING! CUTS OUT GREEDY MIDDLEMEN. "Can make 80% more profit importing merchandise. The Melling Plan gave me new home, newer, own store." Bill Theissen, Canada

I.T. MEMBER STRIKES IT RICH. "Followed your advice and got a free ad. 4,000 mail orders came in. I made \$12,900 this first try, without investment in stock." L.M., Pennsylvania

reveal my Drop Ship Plan that starts you with little or no product investment. Buy one at a time or in quantity.

1000's NEW PRODUCTS EVERY YEAR

With my Plan you get free Membership in International Traders. Vast world wide organization keeps you supplied with new products every month to sell by mail or other ways. Members also attend my personal seminars held in cities near you. Mail coupon for Course and home business report. No charge or obligation. No salesman will call! Find out what Mail Order holds for you!

FREE MAIL ORDER COURSE



B. L. MELLINGER, Famous World Trader, Internationally known Mail Order Expert.

I started in Mail Order a few years ago, part time in my garage. I had less than \$100. I discovered how to make Mail Order pay big. Today my business empire spans the globe... 1,253 acres of land, office buildings, warehouses. My Plan lets you use my experience to make a fast start in your own big profit home business.

FREE MAIL ORDER COURSE COUPON

The MELLINGER Co., Dept. C2252
6100 Variel Avenue, Woodland Hills, CA 91367

Send Free Mail Order Course... Show me how I can start a Mail Order/World Trade Business of my own. There is no obligation; no salesman will call.

Name _____
Address _____
City _____ State _____ Zip _____

*Save 3 days, give ZIP for fast reply!

ANYONE CAN SOLDER WITH KESTER SOLDER

DO-IT-YOURSELFERS!

Let Kester solder aid you in your home repairs or hobbies. A radio, TV, model train, jewelry, plumbing, etc. Save money—repair it yourself. Send self-addressed, stamped envelope to Kester for a FREE Copy of "Soldering Simplified".



KESTER SOLDER
4201 WRIGHTWOOD AVE.
CHICAGO, ILL. 60639



SELF-DEFENSE

KUNG-FU • KARATE

Learn unbeatable fighting power
BLACK BELT INSTRUCTORS

NEW HOME STUDY COURSE CERTIFICATE AWARDED

For details write:
NEW ORIENT KARATE SCHOOL
Dept. 9B Box 5, Avon, N.J. 07717

special offer

Buy The **ATLAS** 6" Screw Cutting Lathe and get a ***Free Chuck**



ONLY \$395⁰⁰

PLUS \$30 SHIPPING & HANDLING

ACCURACY AND DEPENDABILITY
AT A SENSIBLE PRICE...

ATLAS 6" Lathe

has 8 spindle speeds. 6" swing over bed, 6" swing over saddle wings. 19 1/4" between centers. Spindle turns in Timken tapered roller bearings. Reversible power longitudinal feed. Lathe is 11" high, 17 1/2" wide, 34" long. Cuts 8 to 96 threads per inch, right or left-hand. Comes complete with graduated compound rest, tool post assembly, change gears, threading dial, V-belt, motor pulley with 3/4" bore, two 60° lathe centers, wrenches.

***Four-Jaw, 4" Dia. Chuck**

Holds irregularly shaped work. Each hardened steel jaw operates independently. Reversible jaws, has 1" - 10 threads. Wrench included. A \$71.00 value.

- No risk offer. Return purchase within 15 days for full refund if not satisfied.
- Full one year guarantee.

Price subject to change without notice.

Mail To: ATLAS PRESS COMPANY, Dept. 80
2019 N. Pitcher, Kalamazoo, MI 49007

Please send me the Atlas 6" Lathe and 4-Jaw Chuck. Enclosed is my check or money order for \$425.00 (including shipping/handling) or charge my order to:

☐ Visa ☐ Master Charge

Acct. # _____ Exp. Date _____

Name _____

Address _____

City/State/Zip _____

☐ Send for FREE Atlas Lathe Accessories Catalog.

Michigan residents add 4% sales tax.

Available U.S.A. only. Lathe comes via motor freight, shipping/handling to west coast, Alaska and Hawaii require additional freight to final destination. This offer expires 3/31/90.

DRIVING THE 1980 VWs *(Continued from page 99)*

cargo banging around inside won't dent the outside. The tailgate folds down with ease and can be removed completely (without tools) for carrying long loads. Maximum interior bed width is 64.4 inches and maximum payload is just over 1100 pounds.

Rear suspension is a tubular "live" axle with elliptical leaf springs, a stiffer "helper" spring below the bottom leaf and a "soft-entry" compression bumper above the axle that effectively acts as a third-stage spring when the truck is loaded beyond its gross vehicle weight.

This design (instead of coil springs) provides the necessary ground clearance without intrusion into the cargo bed, according to Miller. The rear tubular shocks are staggered to provide axle control on

washboard roads and when braking on rough surfaces. A 15-gallon fuel tank (4.4 gallons larger than the one in Rabbit cars) is mounted forward of the rear wheels and between them, to minimize handling differences as the fuel load changes.

Brakes are power-assisted, with discs in front and self-adjusting drums in the rear. More importantly, there's a load-sensing proportioning valve in the system to prevent any rear-wheel locking under braking at all load conditions.

Pickup choices varied

Like the car, the Rabbit pickup offers your choice of a 1.6-liter, 78-hp (76 in California) gasoline engine or a 1.5-liter, 48-hp diesel. The former is EPA-rated at 23 mpg city and 32

(Please turn to page 160)

A Rabbit Diesel's cross-country hop

Ask the average guy in the street what car he'd pick if he had to drive it 2950 miles in only five days, and he'd probably opt for a Caddy. Or maybe a Mercedes, if he was knowledgeable about foreign cars.

I'd pick a VW Rabbit Diesel, based on the experiences I've had driving these cars from New York to San Diego on two separate occasions.

Last year, I headed west in a four-door Deluxe that was made in Germany. This year, I drove the Pennsylvania-built two-door Custom—the least expensive Rabbit Diesel you can buy for 1980. The only options it had were the new five-speed tranny (\$175) and extra sound insulation (\$40). It was the quietest diesel I have driven—barely any engine noise while cruising in fourth or fifth gears—but it was expensive for such a simple, no-frills machine: It cost \$6490 delivered, not including sales tax.

The tan car appeared so plain that one San Diego resident described it as being "vanilla." Even though it was vanilla, it was still comfortable, even after 12 hours of driving.

The seats don't have separate head restraints like the ones on the Deluxe model, but they're firm and offer good lower back and thigh support. However, since their backrests are flat, upper back support is lacking and there's little lateral restraint during hard cornering.

Superb over long distances

The Rabbit Diesel has excellent ride and handling characteristics, making it perfect for long-distance driving. The ride is smooth, but has just enough firmness so you get a good feel for the road. The Rabbit's steering is precise and has enough self-centering so the car will track a straight course without constant corrections.

The only handling problem I found with the test car was with the live-speed transmission: It was easy to find fifth gear (to the right and up), but downshifting from third to second was difficult.

Last year's test car accelerated briskly for



Rabbit Diesel got 38.7 mpg on 2950-mile trip from New York to San Diego.

a diesel (0 to 60 mph in 17 seconds), but the 1980 model didn't develop much power (this bunny had been fed some dirty diesel fuel and its fuel-injection timing was way off, according to Gene Thompson Motors of Richmond, Ind., the dealer who gave her a check-up after 690 miles).

Even after the car spent three hours in the shop, with injection timing set to specs and a new fuel filter, she still didn't want to hop up to speed as fast as her 1979 sister. The best I could do was 0 to 60 mph in 26 seconds, but heading into the wind it took as long as 44.5 seconds! Thirty to fifty mph was a leisurely 14.2 seconds, while 50 to 70 was a very slow 37.5.

At least fuel economy was excellent: 38.7 mpg overall, with a high figure of 47.3 mpg at an average speed of 53 mph. At a steady 60 mph, I got 36.4 mpg in fourth gear, 46.9 in fifth gear (four-speed Rabbits will get better mileage in fourth gear than five-speed models will, since they have higher final-drive ratios—3.9:1 compared to 4.17:1 in five-speed cars).

If you like your cars plain vanilla, you'll love the Rabbit Diesel, no matter which color you pick. And for \$345 more, you can opt for the more luxurious Deluxe version. But hurry—these Rabbit Diesels are so nice to drive and drink so little that they'll all be adopted by spring. —Moss Miller

SAVE YOUR BACK AND SAVE SOME MONEY, TOO...

as you split firewood the easy way with POPULAR MECHANICS great new log splitter. You build it yourself and then sit back to reap the rewards of a roaring fire. The rig on this hydraulically operated log splitter exerts some 10,000 lbs. of pressure and will easily split 2 ft lengths of maple and ash logs 12 to 14 inches in diameter. With an I-beam backbone, double acting hydraulic cylinder, control valve oil filter, 3 hp gasoline engine and more features, you'll find this log splitter a delight to build and a pleasure to use. And, you'll save your back from aching as well as saving money by splitting that wood yourself. So, have some more time to enjoy the warmth from your fireplace. Send for complete plans and step by step instructions now. Just \$8.95



PM Plans Library **Log Splitter**

Box 1014, Radio City Station N.Y., N.Y. 10019

Please send complete plans and instructions. I enclose a check or m.o. for \$8.95. Make check payable to Popular Mechanics.

Name _____

Address _____

City _____

State _____

Zip _____

Please allow 3-4 weeks for delivery.

PM280

Popular Mechanics is a Publication of Hearst Magazines, a Division of THE HEARST CORPORATION

DRIVE WITH SAFETY—ARRIVE RELAXED P-A-N-O-R-A-M-I-C, WIDE ANGLE REAR-VIEW MIRROR Only \$5⁹⁸



NOW SEE 6 LANES AT ONCE!

- 43 square inch oversized mirror 3 times more vision than smaller mirrors
- Special control switch cuts dangerous high-beam glare from behind

How many close calls have you had because you failed to see the other car in your "blind spot"? You leisurely start to turn, suddenly a horn blasts behind you as you swerve back to your lane. Where did he come from? You never even saw him. Well now you can put an end to "blind spot" bedlam with our 6 lane, rear-view mirror.

This new extra-wide angle mirror measures 13 1/2" wide and is over 3" high... giving you 43 square inches of panoramic viewing that instantly reveals the hidden danger of cars coming from the right or left as well as from behind. This new extra-vision eliminates the danger of your taking your eyes from the road in front of you to twist around and see what's coming from the right or left. It reduces the strain and tension of avoiding "blind spot" catastrophes. You'll find long distance driving less tiring, more pleasant and definitely safer. Possibly for the first time in your life you'll arrive at your destination completely relaxed.

MAIL COUPON TODAY MONEY BACK GUARANTEE

The cost of this Extra-Wide Angle Rear-View Mirror is ONLY \$5.98... less than half the price of smaller mirrors sold in 1978! Remember it slips over your present mirror in seconds and is ready for instant use. If for any reason you are not completely delighted, simply return for full refund (except postage & handling). But don't delay. The safety of you and your family is at stake. Mail coupon today. You'll be glad you did.

**CLIPS OVER
YOUR PRESENT
MIRROR
IN SECONDS**



© 1979 Nat'l Home Prods., 60 Wilton Rd., Westport, CT 06880

MAIL NO-RISK COUPON TODAY

NATIONAL HOME PRODUCTS, Dept. WA-248

60 Wilton Road, Westport, CT 06880

Please send me the new EXTRA-WIDE ANGLE REAR-VIEW MIRROR for only \$5.98 plus 95¢ postage & handling on full money back guarantee (except postage & handling) if I am not completely delighted.

Enclosed is \$_____ Check or money order, no C.O.D.'s please. CT residents add 7% sales tax.

Name _____

Address _____ Apt. # _____

City _____ State _____ Zip _____

☐ **SAVE MORE!** Order two mirrors for only \$10.98 postpaid and save \$2.88! Same Money Back Guarantee.

DRIVING THE 1980 VWs

(Continued from page 158)

mpg highway with the standard four-speed, 21 city and 29 highway with the optional automatic, and a very respectable 23 and 35 mpg with the optional five-speed (give or take a mile-per-gallon in California).

The diesel, fairly snappy for an oil-burner, offers 41 mpg in the city and a whopping 54 on the highway, with the five-speed, according to EPA ratings.

Driving the Rabbit pickup is little different from driving any other Rabbit, with one major difference: Squeezing a six-foot bed into 170 inches of overall length has short-changed the cabin to the point where this six-foot driver had to get out after only a few minutes' incarceration. If you're a bit shorter or don't mind knees-up, elbows-out driving, however, it may not be a problem for you.

Otherwise, all the usual Rabbit attributes are there: uninspired but legible and logical instrument panel, complete with some of the handiest stalk controls in the business, zippy performance, spirited handling, surprisingly smooth ride for such a small vehicle (and a truck to boot) and interior quietness at least as good as the car.

Traction best with light loads

What about the loss of driving traction at the front wheels when the bed is loaded? "Marketing studies," says Miller, "showed that 93 percent of the time small pickups operate at 120 kilograms (265 pounds) of load or less. At that loading, the Rabbit has equal or better traction compared to rear-drive small pickups." In other words, the front-drive Rabbit starts with far better slippery-surface drive traction unloaded than its conventional competition. However, at some point of loading it loses that advantage, and as the load increases beyond that point will be at a disadvantage. Obviously, this problem is of more importance to the buyer who intends to load his truck heavily more than once in a while.

At this point, it's the only small pickup with front-wheel drive and the only one available with an optional diesel engine. Also unique are its low overall and load floor heights (made possible by unibody construction), its car-like ride and handling and its excellent economy/performance compromise with the available five-speed transmission. That's because first through fourth gears are designed for acceleration, while the 0.76:1 overdrive fifth is strictly

SECOND INCOME?

**EASY WITH A
STRUCK-KIT
CRAWLER
TRACTOR!**



Full track Magnatrac outpulls, outpushes, outworks wheeled garden tractors especially in slippery conditions. Kit type tractor (can be easily assembled on a weekend) saves you money (buy factory direct), 16 hp., 4 speeds forward and 1 reverse. Over 30 heavy-duty attachments incl. moldboard plow, dozer blade, snowblower, mower, tiller, hydraulic or electric front-end loader, backhoe. Similar attachments available for our lower cost, highly popular Mini-Dozer. Both Tractors offer you great odd job and resale opportunities. Send now, to:

MINI-DOZER



STRUCK KIT, Dept. PM20 Cedarburg, Wis. 53012

☐ Catalog showing Struck Tractor Kit construction & uses (specify Mini-Dozer or Magnatrac) — 50¢. Both catalogs — 75¢.

☐ Plans for fabricating Struck Tractor (specify Mini-Dozer or Magnatrac) from local materials — \$7.00. Both plans — \$10.00 (Refunded on any purchase.)

Name _____

Address _____

City, State, Zip _____

(DEALER INQUIRIES INVITED)

mileage. And the 49-state gasoline engine does not need a converter, since federal emissions standards for trucks are still a little more reasonable than those for cars, and so they can run on cheaper leaded regular fuel.

While the base truck is a bit of a stripper, the LX version comes with deluxe trim, wider wheels, steel-belted radial tires, AM/FM radio and vent windows.

Other options that are available include alloy wheels, airconditioning, remote control outside mirror, western mirrors, cargo bed tie-down rails, sliding rear window, special instrumentation, a trailer hitch with wiring and a "Sport Truck" graphics package. Rated towing capacity is 1500 pounds with trailer brakes and 1000 pounds without.

Vanagon handles better

For only the second time since VW invented it, the camper/bus has been completely redesigned. Introduced in 1949, it was first redone in 1967, and some 5.5 million have been built and sold worldwide in 30 years of production.

Compared to its predecessor, the 1980 VW "Vanagon," as they call it, has a wider track and a lower center of gravity for vastly improved handling and stability, much more glass area for better visibility, and improved aerodynamics for fuel economy and highway performance. What it doesn't have, unfortunately, is a new engine with more power to push it up the hills.

Still, the old, trusty, tried-and-true air-cooled flat Four is fuel-injected these days and puts out an honest and reliable 67 hp all day long from its 2.0 liters. VW says that most people in Europe buy the bus with an even smaller 1.6-liter engine for the extra fuel economy, so it figures we should be happy here with the 2.0.

You might wonder why VW didn't go to a modern, front-mounted, water-cooled engine with front-wheel drive like every current VW passenger car, or even to conventional front engine/rear drive like the company's larger European-market vans and trucks. Fact is, it looked at 12 different configurations and a variety of engines, ranking each in terms of space utilization, comfort, performance, economy, handling and other factors. And when the tallies were made, sure enough, the old air-cooled, opposed Four in the back came out the winner.

While the front-drive configuration works great for a small car and even a small truck designed for light

loading, it wouldn't work so well for the Vanagon. Weight distribution, for instance, whether loaded or unloaded, works out to nearly 50/50 because the driver, spare tire and fuel tank are up front, and most of the cargo weight ends up between the axles.

The vile handling characteristics of VW's original bus were improved somewhat with the 1967 design, but the latest version is head and shoulders above that, thanks to the wider treads, lower center of gravity, revised rack-and-pinion steering geometry and all-new front suspension with upper and lower control arms, coil springs, tubular shocks and a sway bar. An improved version of the '67-'79 model's semi-trailing-arm, double-jointed-axle independent rear suspension with progressively wound coil springs and tube shocks holds its own in back. Brakes are ventilated discs in front and drums in the rear, complete with a pressure regulator to prevent rear-wheel lockup under hard braking.

Other comparisons to the previous model include: a 2.4-inch lower floor and two-inch higher roof; eight-inch lower cargo floor over the engine; 75 percent larger rear cargo room and a nearly five-foot shorter turning circle. Wheelbase is increased by 2.3 inches, front track by 6.9 inches, rear track by 4.5 inches and overall width by 3.3 inches. But in spite of all this increased capacity, the pop-top camper version (at 77.2 inches overall height) will still fit into the average garage.

A convenient dashboard

Mounting the high seats in the forward-control cab leaves no doubt that this is a van, but once buckled up inside you'll find it much more comfortable and carlike than the older versions. The instrument panel is plain but pleasant, with everything easy to see and reach, including the long gearshift handle. The steering wheel angle is far less bus-like than before. Although the standard seats don't fully recline, they do have 25 percent more fore-aft travel and a few notches of backrest angle adjustment to help you find the best seating position.

It's no sports car, but the thing is amazingly agile and stable in cornering maneuvers. VW says it generates 0.7 lateral "Gs" on a skid pad vs. 0.63 for the '79 version. Crosswind stability is also improved (35 percent at 62 mph), steering effort is reduced by 50 percent, heating and ventilation are significantly better and interior noise levels are three to five decibels lower than before, de-

pending on the speed. Improved aerodynamics should just about cancel the added size and weight, giving fuel economy similar to last-year's model... 17 mpg EPA city, 23 mpg highway for the four-speed, 49-state version.

Imported from West Germany, the 1980 Vanagon is available as a standard wagon (seven or nine-passenger), a semicommercial Kombi van or a full-fledged Camper with pop top, swiveling front seats, table, wardrobe, pantry, two double beds, water hookup and (in the deluxe version) refrigerator and two-burner stove.

Rabbit convertible is fun

Following in the footsteps of VW's homely but lovable Beetle convertible is its logical successor, the Rabbit convertible. The only Rabbit model not built in the United States this year, it's basically a loaded and expensive (\$8895) ragtop version of the deluxe Rabbit sedan, complete with vinyl-covered roll bar and heavily padded and lined top that folds into an unsightly lump nearly as tall as the windshield.

Surprisingly, rear vision with the top down isn't as bad as you might expect; keeping it above the beltline leaves the space underneath available for cargo, accessible through a small hatch door in back or from the inside via a folding rear seat. Adding to the car's top-down visual discord are the rear quarter windows, which roll down only about halfway.

Aesthetics aside, however, the little topless Rabbit is even more fun to drive than the tin-top versions, and it's quicker, more economical and roomier inside than the aged Beetle it replaces. Top up, it's quiet and snug inside, and there is very little noticeable wind noise or leakage.

The five-speed transmission, twin remote control outside mirrors, a glass rear window with electric defogger, vent windows, reclining front seats, console, sport instrumentation, AM/FM stereo radio with cassette tape and a choice of cloth or leatherette upholstery are all part of the standard package. Airconditioning, alloy wheels, sport steering wheel and sport seats are optional. Bodies for the limited-production convertible are built by Karmann coachworks in Osnabrück, West Germany.

German-built Scirocco sport coupe and Dasher sedans and wagons are continued with only minor engineering improvements for 1980. The diesel-engine Rabbits now come from VW's Pennsylvania plant instead of from Germany. **FM**

Fantastic Price Break! Only \$5⁹⁸

NOW AVAILABLE
TO THE PUBLIC



KEEP THAT "SHOWROOM SHINE" FOR 3-YEARS AND NEVER WAX, POLISH or BUFF AGAIN!



POLYMER GLASS MIRACLE SEALANT APPLIES IN LESS THAN 1 HOUR!

**Not a wax! Not a polish!
A miracle of modern chemistry!**

You simply wipe it on to "wrap" your car in a protective glass-smooth surface! Just as acrylic finishes revolutionized the paint industry... just as epoxy adhesives made ordinary glues obsolete overnight... now a breakthrough in chemical science has produced an incredibly hard, super glossy, non-stick "polymer glass" sealant that can "glass in your car's showroom shine" virtually for its lifetime!

The Famous "Shock Test" Dealers Use

Dealers who have been charging an arm and a leg for this fabulous treatment have a standard sales pitch. They wipe a bit of this amazing formula on your car and then, while you're watching, deface it with a marking pen. Almost before you can scream in protest, they simply wipe it clean again! And while you're still speechless, they sell you a complete "glassing" for anywhere from \$85 to \$200 — whatever they think they can get!

The Secret is Simple — The Magic is in the Product

Glasscote's polymer glass formula

literally fuses itself to the finish of your car by "molecular bonding". And it contains a formulation similar to that used to make those "non-stick" frying pans, so it's so glossy smooth that practically nothing will stick to it! Even bird droppings and crushed insects simply slide off with the touch of a damp cloth.

**It takes less than 60 minutes
to Glasscote your car**

Now you can get the identical protection for your car with Glasscote, and all you need do is all the dealer does — wipe it on, let it dry, and wipe it off! So why pay somebody \$85-\$200 an hour to do it for you? Why not buy Glasscote direct-by-mail for only \$5.98 — enough for three years treatment for a small car — more than enough to Glasscote even the biggest Mercedes, Rolls, or Cadillac for 12 full months! Simply wipe it on once a year and forget about all that waxing, polishing, and buffing forever! A simple soap and water washing or a wipe with a damp cloth restores the gloss!

Even if your used car is already dingy looking from oxidation, Glasscote helps remove it and restore a brighter color and more glossy shine.

PROTECT NEW OR USED CAR PAINT AND BRIGHTWORK AGAINST ALL THESE HAZARDS!

SNOW	SMOG & POLLUTION	BUGS	MUD
RAIN	OCEAN SPRAY	TREE SAP	ROAD
SUN-WIND	AIRBORNE SOOT	BIRD DROPPINGS	SALT

— EVEN VANDALISM FROM MARKING PENS!

Once you seal your car in Glasscote, its finish and chrome is immune to the worst conditions nature or man can devise! You're protected against:

- ... oxidation that can fade or change paint color
- ... corrosive smog, acid precipitation, industrial pollution, oily airborne soot
- ... road tar stains and smudges
- ... sticky tree sap, crushed insects, bird droppings
- ... salt sea air or road salt splashes that can pit, corrode and destroy chrome.

Save Gasoline — Add Resale Value to your Car

Experts say the smoother your car's finish, the less wind resistance it has, which means it can go farther on a gallon of fuel. And when you come to sell your car, you know what a difference appearance makes. A car with "showroom gloss" three, four, or five years old is bound to bring hundreds of dollars more than the same car with dingy, oxidized finish. So release yourself forever from the bondage of constant waxing and polishing, and insure yourself of top dollar on your trade in years from now! Mail coupon now!

3 YEAR GUARANTEE!

Simply use Glasscote as directed. If its "showroom shine" is not maintained for a period of 36 months, if the Glasscote surface doesn't totally and completely please you, its glossy, dirt-repellent qualities are not instantly apparent and noticeably superior, if you're not delighted in every way, return the unused portion to National Home Products, Customer Service, 60 Wilton Road, Westport, CT 06880. Our refund check for the full purchase price (except postage & handling) will promptly be sent to you!

***** MAIL NO-RISK COUPON TODAY *****

NATIONAL HOME PRODUCTS, Dept. GCS-293
60 Wilton Road, Westport, CT 06880

Please send me _____ bottle(s) of Glasscote at \$5.98 plus \$1 shipping and handling per bottle.

If at any time in the next 3 years my car loses its "showroom shine", I may return the unused portion for full refund (except shipping and handling).
SAVE: Order 2 bottles for only \$10.98 postpaid.

Total amount enclosed \$_____ CT residents add 7% Sales Tax.
Check or money order, no C.O.D.'s please.

Charge it please to: ☐ American Express ☐ Visa
☐ Master Charge (Bank Number _____)

Card No. _____ Expiration Date _____

Name _____

Address _____ Apt. # _____

City _____ State _____ Zip _____

11 ways water gets into your basement—and how to stop it

A chronically wet basement can be one of the toughest problems for a homeowner—or professional—to diagnose. PM prescribes the cures.

by John H. Ingersoll

Anyone who has pumped out and mopped up a basement flood knows the hopeless feeling it generates and the damage water leaves in its wake. Out-of-season clothes, shoes, books, dry firewood, golf clubs, oil-pump motors—all suffer from a forced bath.

Listed below are 11 common situations which potentially lead to a wet basement. Find those cases which resemble your own and read what you can do about them.

1. Seepage from basement window wells occurs when rainwater collects in the wells and enters

through cracks around the window or through the foundation itself.

Cures: Build up the curb around a window-well perimeter with masonry or corrugated metal. Where no drain exists, install one attached to piping leading away from the foundation as shown on page 164.

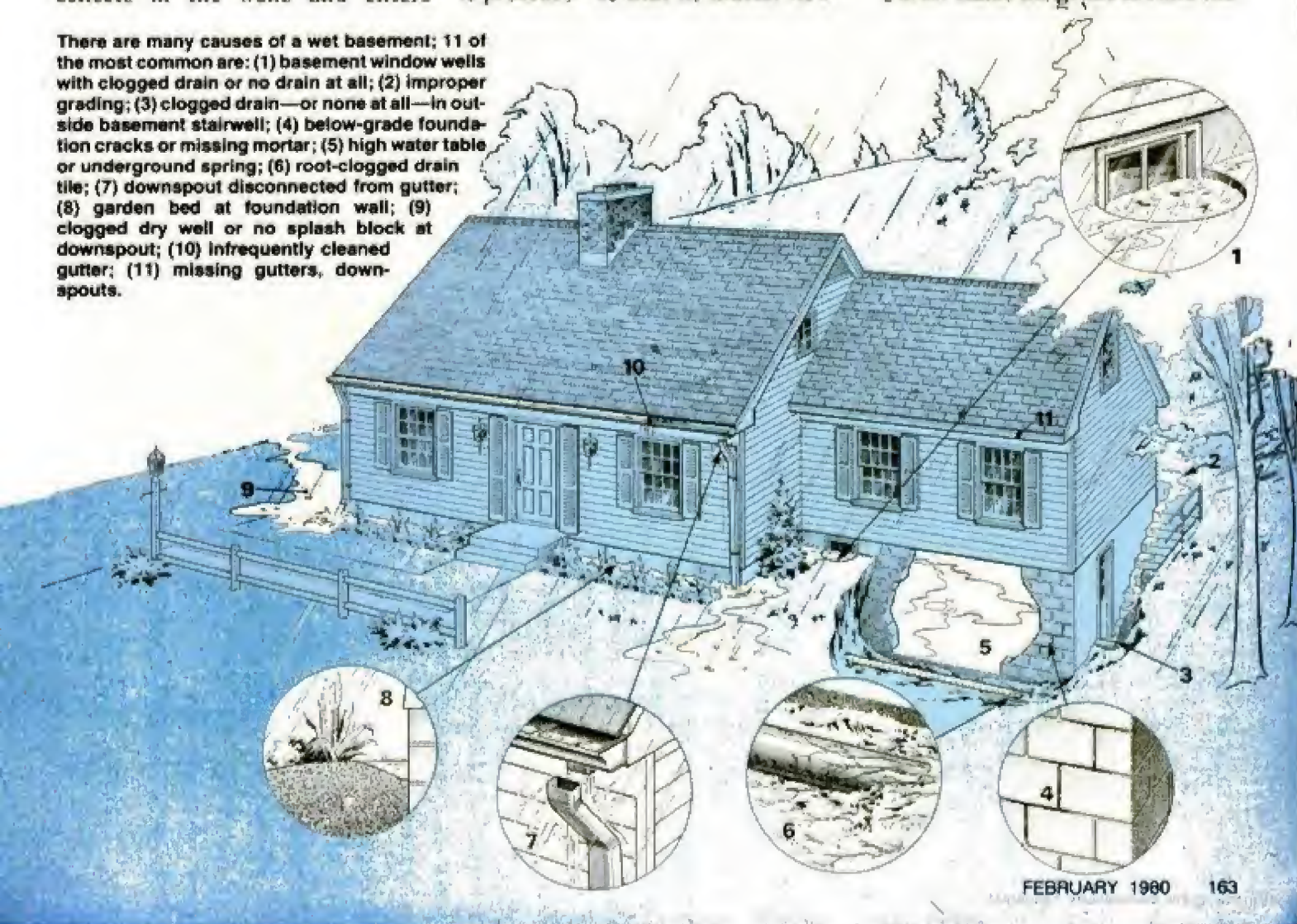
2. Poor grading around the foundation accounts for most basement water problems. Faulty grading is described as any soil condition that dumps water against a foundation wall. The water eventually builds enough pressure—called hydrostatic pressure—so that no matter how

well foundation walls are protected against seepage, it will find a way in.

The commonest form of poor grading is ground leading away from the house on the level, or worse, inclined uphill. These situations are not too hard to correct. The toughest problem occurs when a builder fails to provide ground-water drainage for a house built into a hillside or he digs a swale (depression) at the base of the hill, but underestimates the amount and force of water coursing down the hill toward the house.

Cures: Raise the grade around the

There are many causes of a wet basement; 11 of the most common are: (1) basement window wells with clogged drain or no drain at all; (2) improper grading; (3) clogged drain—or none at all—in outside basement stairwell; (4) below-grade foundation cracks or missing mortar; (5) high water table or underground spring; (6) root-clogged drain tile; (7) downspout disconnected from gutter; (8) garden bed at foundation wall; (9) clogged dry well or no splash block at downspout; (10) infrequently cleaned gutter; (11) missing gutters, downspouts.



foundation so that a fall of at least 1/2 in. to the foot continues down and away from the house at least 6 ft., and preferably 10. With fresh mortar, parge bare masonry around the foundation before packing new soil against it, or adhere a layer of 6-mil black polyethylene to the masonry surface. Over the new soil, plant a thirsty ground cover, such as pachysandra, vinca minor or periwinkle—or put down sod.

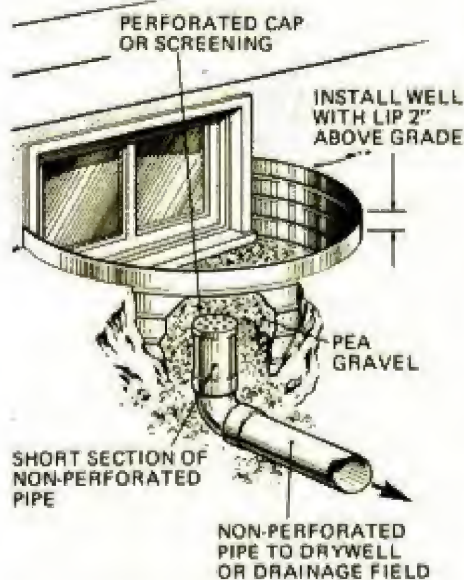
For the hillside house at the foot of a virtual waterfall during a rainstorm, the cure takes more time and energy. Redirect water around the house and downhill by a French

drain—a ditch filled with crushed stone. This water-absorbing ditch parallels the line where hill and level lot meet.

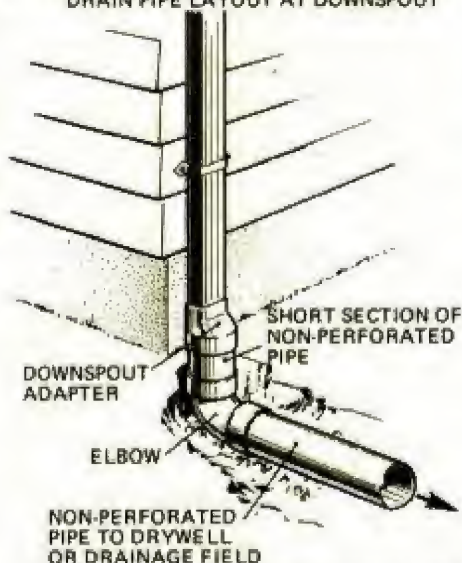
Viewed from a helicopter, the drain looks like a U around the house, its base on the uphill side. Depth and width of the ditch will vary. Minor runoff from a mild incline may need a ditch only 6 in. wide and 6 in. deep. Steeper hills require larger ditches. Hard clay soil needs more drainage than sandy soil. Cover the stone-filled trench with straw, topsoil and sod. At the line below the hill, sod cover should be at the center of a slight swale, so hill-

SIMPLE DRAINS FOR COMMON PROBLEMS

DRAIN PIPE LAYOUT FOR WINDOW WELL



DRAIN PIPE LAYOUT AT DOWNSPOUT



Install drain in basement window wells (left) which fill up with water during storms and cause seepage into basement. Downspout runoff (above) carries water away from house to prevent pooling at wall.

New water-sensing alarm system

Touch Flood Alert's sensors to moist surface and it will sound an 85-decibel beep (at 10 ft.). Used in laundry rooms, bathrooms, kitchens or basements, it can warn of leaky or broken pipe connections or rising ground water. It's \$15 postpaid from Datasonic Inc., 150 West Pine St., Long Beach, N.Y. 11561.—J.P.



Alarm, placed at base of furnace, will sound if basement floor becomes wet.



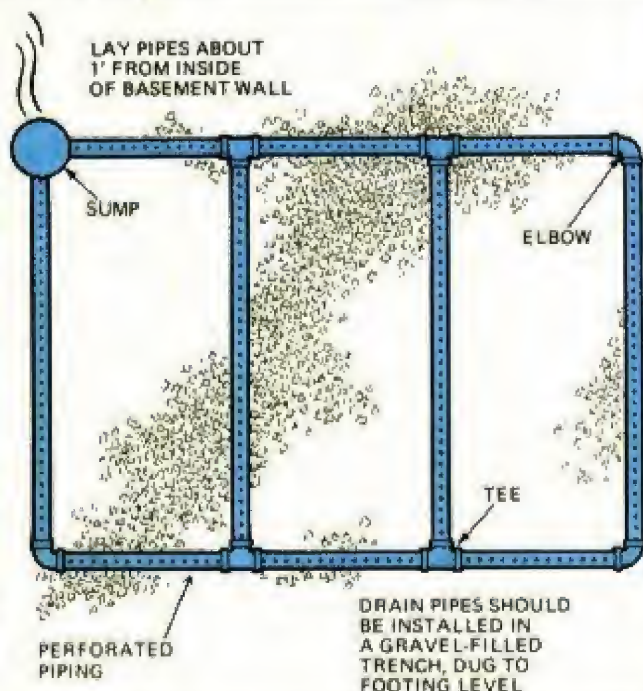
Solid-state alarm, powered by 9-volt battery, has UL-approved sound device.

If all else fails . . .

When all efforts at stemming basement leaks have failed, consider the use of a pressure-relief system. If you're really ambitious you may attempt to do it yourself. Use a cold chisel and hand sledge (the long hard way) or a rented jackhammer to break open a 12-in.-wide trench around the perimeter of the basement floor. Once through the slab, dig and remove soil to a depth of at least 12 in. If the trenches slope at all, the drop should be toward the sump. Level trenches, however, are adequate. Fill 1-ft.-deep trenches with 2 in. of crushed stone, continuous 4-in. perforated plastic pipe (with elbows at the corners), and then add more stone to the floor level. Leave the trench open and form a slight swale (depression) at its center.

For floors which persist in puddling up, or for those with existing sump pumps that are located away from the wall, additional trenches can be cut (see diagram). Lay in the same stone/perforated pipe/stone combination, attaching the pipe to the perimeter sections with tees. Then cover these trenches with fresh concrete so that you have use of the basement floor again. Covering the perimeter trenches is an option to consider.

If you don't already have a quality sump pump, you should purchase and install such a unit (see *Prevent Basement Flood Damage With a Sump Pump*, page 162, Feb. '79). Lead the evacuating pipe to an area drain, a dry well that's located at least 25 ft. away from the house, or to an open outfall on the downhill side of your property.



draining water has a chance to soak into the French drain.

As added insurance to catch a large volume of water, lay drain pipe over 2 in. of stone at the base of the ditch before backfilling with the remaining stone.

At lower ends of the drain lines, divert outfalling water with rock so the current doesn't carve furrows in the lawn. Or, connect the drains to solid piping that carries water underground to drainage.

3. Exterior basement entries are often water routes to basements. You may have too low a curb around your stairwell opening, a clogged drain, or may lack a drain in the stairwell. Double metal cellar doors that have been climbed upon or banged with a heavy object may have damaged runoff channels that direct water into the basement.

Cures: Same as for No. 1. Use caulking to seal around metal cellar doors. Bend deformed channels back in position if possible.

4. Cracks in masonry or at masonry joints are a common cause of

water infiltration. Masonry that is porous and subjected to ground-water pressure is also a sure candidate.

Cures: If you have eliminated water against the foundation wall as much as possible and still have moisture or seepage, consider applying an interior masonry sealer.

Two types of sealers are readily available: Portland cement with additives such as synthetic rubber, and epoxy compounds. A third type, Xypex, which entered the U.S. market last year, contains Portland cement, finely-ground silica and several active organic chemicals. Mixed with water, this batch penetrates wet masonry, forming crystals within the masonry pores. Once formed, the crystals block seepage. A comparison of the three types appears in the chart on page 166. Follow manufacturers' directions for wall preparations to the letter.

5. A high water table or an underground spring are the rarest sources of basement floods, and are most difficult to stop. If water in

your basement is essentially clear, it probably flows from one of these sources.

Cures: The pressure-relief system described on page 164 should handle the problem.

6. Clogged drain tile around the foundation footing forces ground water against the foundation or beneath the footing into the space below the floor slab. Old clay drain tile laid in sections is usually to blame. Silt and soil build up between sections that have worked apart. A tree root may have broken through a tile (and could do the same to newer plastic drain piping).

Diagnosing this problem is difficult; the only sure way is to dig down, unearth the tile and examine it. That's time-consuming, and should you have it done, expensive. A simple test, however, tells you the direction from which water comes. If water lying on the basement floor is muddy or laced with silt, it's a 99-to-1 bet it came from the ground around the foundation, and just possibly seeped into the basement be-

HOW TO SEAL YOUR BASEMENT WALLS FROM THE INSIDE



Before applying sealer, use wire brush to remove loose debris; then plug all holes and floor/wall seams with patching mix.



Apply single-coat, Portland-cement-type sealers with a stiff brush to get the granules into masonry pores.



Spread two-part epoxy sealer with a polyester brush. Do not mix more than you can handle—or compound will begin to set.



Xypex sealer, new on the market, is brushed onto a wall that has been wetted. Compound penetrates concrete to form seal.

BASEMENT WALL AND FLOOR SEALERS

Material	Before Applying, Fill Holes and Cracks With	Apply Over Paint?	Apply Over Wet Wall?	Coverage	Masonry Penetration	Recommended Number of Coats	Warranty	Paint Over It?	Approx. Cost (1000 sq. ft.)
Drylok (Portland cement plus additives, i.e. synthetic rubber)	Hydraulic cement	Only over a cement-base paint in good condition	No, but okay over damp wall	75 to 100 sq. ft. per gallon	Deeper than paint	2	Five years when applied correctly	Yes	\$210
Devcon (Two-component epoxy compound)	Hydraulic cement or Portland cement mortar	Only if paint condition is very good	No, but okay over damp wall	150 to 200 sq. ft. per gallon	Forms tough outer coating	2	None	Yes	\$350
Xypex (Portland cement, silica, organic chemicals)	Thicker mix of Xypex	No	Yes; will not work otherwise	6 sq. ft. per gallon	Several coats, thickness of foundation wall	2	Warranty by applicator who does job	Yes	\$385

Where to get professional help

If you decide that you need outside help, call in a professional for a diagnosis and estimate. But be wary. Over the years, basement waterproofing has been a profit bonanza for gyp artists. One of their favorite gambits is to convince an owner they will waterproof the outside of a basement wall without digging up a spoonful of soil. How? By inserting a hose into the ground at intervals along the foundation and pumping in a surefire formula that is meant to spread and seal the masonry successfully.

"Absolute nonsense," says the president of the oldest waterproofing company in New

York City, a company engaged in sealing commercial buildings, tunnels and bridge supports.

The technique was originally based on a passable idea: pumping bentonite into the soil around a basement. Bentonite is a clay-like substance derived from volcanic ash. As the material absorbs water, it expands. In the soil, bentonite is intended to draw off ground water aimed at the foundation wall, and simultaneously expand, in theory, pressing dry backfill against the foundation wall.

In practice, the bentonite scheme failed enough times to give the method a shaky

reputation. And more than a few owners learned later to their dismay that the formula injected around their house wasn't even bentonite, but a cheap, worthless imitation of the clay-like substance.

But don't give up. There are reputable contractors. Find one the way you would locate any professional—by asking friends for recommendations, then checking out the contractor's stated reputation. A good place to start looking? Call the nearest chapter of the National Home Improvement Council. Or write the national office of NHIC at 11 East 44th St., New York, N.Y. 10017.

cause of blocked drain tile. Clear water usually indicates a spring or high water table.

Cure: Double check water sources through 3. If you can divert ground water from the drain tile, whether the tile is blocked or not becomes irrelevant.

Having completed your checking and correcting only to discover during the next downpour that the basement still leaks, proceed to the next least-expensive step: Seal the basement walls, the periphery of the floor.

In the unlikely event your basement still leaks, review your latest work. Have you missed anything? Skimped on application? If not, you need the pressure-relief system.

7. Broken or rusted-out downspouts and gutters that fail to carry off water are obvious trouble sources.

Cure: By all means, repair breaks and replace rusted-out sections of the rain-carrying system. Often, the weak point is the right-angle gutter beneath a roof valley. During a hard rain, valleys can catch and send more water coursing than a gutter will carry. If possible, cut a downspout into the system at the angle, and divert the outflow.

8. Flower beds parallel to the foundation are a form of poor grading that can also lead to water where you don't want it. Gardens crested in the center are the worst

offenders—they invite water to pool and seep along the foundation wall.

Cure: Get rid of the garden. Build up the grade as noted in No. 2, and plant ground cover or lay down sod.

9. A downspout that pours water only a few inches from the foundation wall is little help. It may cause the soil to become saturated (boggy) with water, thereby increasing the likelihood of basement seepage. A stopped-up or flooded dry well close to the house produces the same effect.

Cures: At least, put a stone or concrete splash block under the downspout. Better, attach a rolled vinyl hose to the downspout end. Force of the flow unrolls the hose and deposits water some distance away from the foundation.

Best of all, connect the downspout with solid piping leading to an area drain, or a dry well excavated at least 25 ft. from the foundation. (A dry well is 6 to 8 ft. deep, 4 to 6 ft. in diameter, and walled with unmortared stone or concrete block. The top is closed with a stone slab or cast concrete lid. Then covered with a layer of topsoil and sod to match the lawn.)

If you suspect an existing drywell is clogged, open it and use a power or hand-operated bilge-style pump to suck out the water.

Dig out the base of the dry well

another foot or so, and replace the soil with crushed stone. That's minor surgery.

If your yard resembles a swamp, dig trenches for at least two drain lines leading from the base of the dry well away from the house. Rest the drain pipe on 4 to 6 in. of crushed stone, and cover the piping with straw or insulation before backfilling so the pipe perforations don't clog with dirt.

10. Clogged gutters resemble Nos. 7, 8 and 9 in their damaging effect. They are, however, a lot easier to remedy.

Cure: Climb to the roof and, using a garden trowel or gloved hand, scoop gutter-muck into a bucket or to the ground. Install "bird-cages" or screening at top openings of all your downspouts to prevent the possibility of clogging with twigs and leaves.

11. The lack of gutters and leaders can cause ground beneath the eaves to erode. During a rain, the depressions fill with water that eventually will find its way inside your basement.

Cure: Install a rain-carrying system. **PH**

SEALER MANUFACTURERS

Devcon Corp. (Devcon Epoxy Sealer), 61 Endicott St., Danvers, Mass. 01923
United Gilsontite Laboratories (Drylok Ready-mixed Sealer), Scranton, Pa. 18501
Xypex Chemicals Ltd. (Xypex) 12520 Vickers Way, Richmond, B. C. V6V 1H9

What's so hard about building a Heathkit product?

nothing!



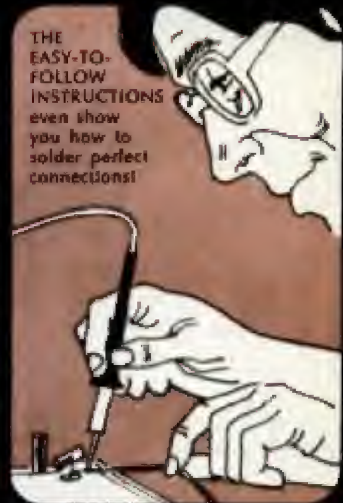
STEP-BY-STEP, CHECKING AS YOU GO — you can't go wrong when you do one step at a time and check your work!

GET STARTED



ALL THE PARTS ARE INCLUDED — even solder — so all you need are a soldering iron, wire cutter, pliers and a screwdriver!

THE EASY-TO-FOLLOW INSTRUCTIONS even show you how to solder perfect connections!



ALL FINISHED



ONE LAST CHECK that all the connections are made right, and you're ready to turn it on...

IT WORKS



AND TO THINK YOU BUILT IT YOURSELF! It's a great feeling. You saved money — you enjoyed it — and you ended up with a great, hand-crafted product!

You can start right now...fill in the coupon and mail it today!

FREE

**HEATHKIT®
CATALOG**

Heathkit products are displayed, sold and serviced coast-to-coast at Heathkit Electronic Centers (Units of Veritechnology Electronics Corporation). See the white pages of your phone book for the store nearest you.

If coupon is missing, write:
Heath Company, Dept. 017-622
Benton Harbor, MI 49022



Read about nearly 400 money-saving, easy-to-build electronic kits — stereo, color TV, clocks and weather instruments, auto and aircraft accessories, Amateur Radio Equipment, Personal Computer Systems and much more! Simply mail the coupon below or take the coupon to your nearby Heathkit Electronic Center.

Heathkit

Heath Company,
Dept. 017-622
Benton Harbor, MI 49022

Please send me my FREE Heathkit Catalog.
I am not now receiving your catalogs.

Name _____

Address _____

City _____ State _____

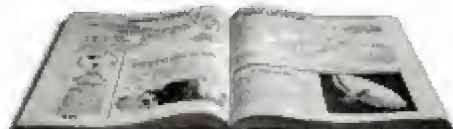
CL-725B Zip _____

solar saves

The World's Largest & Most Comprehensive Buyers' Catalogue of Solar Energy Products! State of the Art Solar Products, Ideas and "How To" Information on Solar Principles, Installation and Tax Credits & Advantages. An exciting, Giant 350-Page Money-Saving Sourcebook! Send For Our Catalog Today.

Credit Card Buyers . . .
Call Toll Free (800) 537-0985
 In Ohio Call (419) 937-2226

Now Only \$5.00



Solar Sourcebook

☐ **YES!** Enclosed is my check or money order for \$5.00. Send me the **Peoples' Solar Sourcebook**.

Name _____

Address _____

City _____ State _____ Zip _____

Mail to: **Solar Usage Now**
 450 E. Tiffin Street
 Department E-2
 Bascom, Ohio 44809

Print For Profit

Cards: stationery, envelopes, advertising, labels, tickets, OSI cards, announcements, greeting, sympathy, prayer cards; tags, etc. Save money.

Own a Printing Business.
 We supply everything direct from factory. Easy instructions. Also raised printing like engraving. Have home shop. Add to income. Send 25¢ for catalog.

Kelsey Presses, 80-BN Meriden, CT 06450



BASEMENT TOILET

Flushes up to existing sewer or septic tank by powerful, self-contained pump operated by normal water pressure. No digging up floors. Clog resistant, easily installed. Make basement into game room, den, apartment with private bath. Write for free literature. Dealer inquiries invited.

DOSS MFG. Dept J-25, Box 10947, Houston, Texas 77018



BIRD
 Frame and Fork

BUY DIRECT!
MINI-BIKE FRAME!

New bolt-together frame. No welding. Complete with plans. Fits 3 1/2 hp gas engine.

Send only \$39.95 for your frame. Also available are new engines, wheels and etc. Send \$2 for plans.

BIRD, Box 34422, PM2, Omaha, Nebr. 68134

Enjoy Your Own Business

Start Earning at once—No special experience required

A SHOP
 IN ITSELF
 AUTOMATIC
 FOOLPROOF



STAND-ALL Model 7

Sharpens & Retools
 Hand Saws 3 point
 through 16 point.

SHARPENS—
BAND SAWS—
HACK SAWS—
WOOD AND
METAL CUTTING
SAWS

with straight back and
 identical tooth profile.
CROWNS—adjusts to
 any standard crown.

HOOKS 5" to 21"
BEVELS—0° to 30°

SMITH-NIELSEN
 EQUIPMENT CO.

Mfg of Saw
 Grinders
 Distributor of
 Complete Saw
 Shop Equip
 509-535-9811

PM-2-80

Box 2505 Terminal Annex, Spokane, Washington 99220

POWER KING one tough tractor!

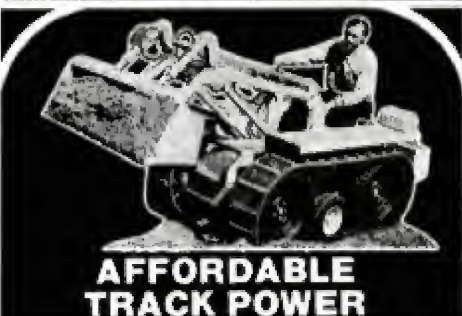
Mows grass at 3 acres per hour; 48", 60" mowers, 5' sickle bar. Plows, fills, bulldozes, clears snow, splits logs and more. 25 attachments. 12, 14, 16, 18 hp. All-gear drive gives more usable power, saves gas.



Free catalog Engineering Products Co., 1005 K-2 Anoka Ave., Waukesha, WI 53186.

C-65C

NAME _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____



AFFORDABLE TRACK POWER

NEW—Utility Crawler Tractor; high flotation steel cleated rubber tracks. Buy Factory Direct in KIT or Completely Assembled. Over 30 attachments—backhoe, loader, blade, garden plow, etc. Send for 16 pg. Catalog . . . 50¢, or for "Build-it-yourself" plans . . . \$7.00 (refunded on any order).

Oahco Corp. Dept. PM20 Cedarburg, WI 53012

Learn ACCOUNTING at home

Learn about careers in Accounting, Bookkeeping, Tax Returns. Send for FREE "ACCOUNTING CAREER KIT" WITH COUPON.

NAME _____ AGE _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 FREE BOOK NORTH AMERICAN SCHOOL OF ACCOUNTING, Dept. PB810
 4500 Campus Dr., Newport Beach, CA 92662

Portable Steam Cleaner

Steam in 60 seconds

CLEAN:
 Engines, Air Filters, Lawn Mowers. 3 year guarantee on fire box, coils. Uses liquid soap, propane fired. Weight 120 lbs. Auxiliary pump required on low water pressure.

WEDCO MFG. INC., Dept. M-10
 Scott Lane • Box D, Jackson, WY. 83001



Create a Family Treasure as Thousands Have Since 1916

Handcrafted by our own grandfathers, our grandfather clock kits are semi-assembled, easy-to-build, of solid 3/4" walnut, cherry, mahogany or oak. Kits include beveled glass. We handcraft our spun brass Lady Florentine and Goddess Diana Lyre pendulums. Tubular bell or Westminster rod chimes. Hand painted moon wheels. Send for free color literature of all kits and movements or send \$2.50 for 3 plans: AMERICAN CLASSIC, SPIRIT OF MOUNT VERNON and SPIRIT OF THE CENTURY, plus literature.

KUEMPEL CHIME CLOCK WORKS & STUDIO, PM-01
 21195 Minnetonka Blvd., Excelsior, MN 55331.

COMPUTERIZED SKETCH PAD

(Continued from page 88)

until now, has only been available on the most expensive computers.

Enter the design mode and the computer displays a blank screen with the working area outlined and a row of electronic symbols at the bottom edge. Move the pen to touch one of the electronic symbols and you have "loaded" it with that symbol. Touch it to the tablet and you display the symbol on the relative spot on the computer display.

This CAD mode can be adapted for all sorts of things, such as architectural design and flow charting or anywhere the same symbols are used time after time. Right now, Talos makes available only the software for electronic symbols, but you can program your own or wait until others are released.

The Digikitizer not only draws figures and lines, it can help you to understand geometrical relationships as well. Suppose you have a complicated two-dimensional figure for which you need to find the area. All you have to do is trace the figure, or a scale representation of it, on the surface of the tablet. As soon as you have defined a closed shape, the computer will not only display the shape but automatically calculate the area. The same principle is applied for calculating straight-line distance, such as routes on a map.

The inside story

The main reason Talos can sell this unit at \$499, less than 50 percent of competitively priced tablets, is that it's a kit. It's an easy kit to assemble but requires painstaking attention to detail. It is not for the beginner, but the instructions are as good as the more complex Heath-kits. It took us four evenings to assemble, about 16 hours in total.

The circuitry is, unsurprisingly, quite complex. The basic idea is that the pen is held above a gridwork of fine, copper lines atop a printed-circuit (PC) board just beneath the plastic tablet top.

The pen sends out high-frequency energy and the circuits inside the Digikitizer sense which copper lines the pen is above. Then, this data is translated into computer-display information and put in the computer.

We found the Digikitizer to be an exciting computer peripheral (accessory). Its low cost and ease of use contribute to the enjoyment.

Home computers are coming down in price and peripherals such as this one cannot fail to make such computers ever more popular. It sure does beat a crayon and paper! **PM**

SEAMLESS SPRAY PUTS YOU IN AN INFLATION-PROOF BUSINESS!

SELL PART-TIME MAKE FULL-TIME INCOME

**\$500 ON JUST
ONE ORDER...**

**LOTS MORE
IF YOU WANT IT.**



Make over \$500 on average Seamless Spray sale to schools, factories, shopping centers, etc. Many orders pay over \$1,000 commissions.



Make \$748 on a 10 barrel Seamless Spray order for Liquid Metallic Sidings. The easy, fast way to waterproof, caulk and insulate building exteriors.

Through a series of circumstances created by inflation, I can now offer one of the most unusual opportunities in the history of direct selling. And best of all, you need no specialized experience to handle it. Absolutely none whatsoever!

If you've done any selling at all you know you can't make it anymore selling nickel and dime items. You can't afford to bust a gut selling a half dozen orders a day and wind up making \$25 to \$30. You need a necessity that everybody needs—that's quickly and easily sold because it solves problems born out of the inflation.

We call our process SEAMLESS SPRAY. It fills a vacuum created by the soaring price of new roofs. Roofs everywhere are leaking—in desperate need of repair. Using our Seamless Spray Equipment, factories, plants, shopping centers, schools, hospitals, apartment complexes use their own maintenance people to renew, waterproof these roofs at a cost of less than 12 cents per square foot. We loan equipment absolutely free. On the average Seamless Spray order you make over \$500. You need absolutely no experience in our

business. Our program is organized step-by-step for easy, successful use whether you sell General Motors (they are Seamless Spray users) or the corner garage.

When I tell you, PACE saved one school \$28,400 with Seamless Spray roof renewal, you'll understand how fast you eliminate sales resistance. Your market is pre-sold. Roof contractors with their exorbitant prices hand you the business on a silver platter.

Give PACE as little as 8 hours a week—that's all we ask. Once you start making \$500 and more on one Seamless Spray order, then you'll consider full time PACING. In addition to Seamless Spray you'll also get our Siliconized PARK-KING Blacktop Sealer—our Liquid Metallic Siding—and a complete line of highly specialized Labor-Saving One-Coaters designed to save big money on all kinds of building maintenance. Each meets the BIG SELL concept, where you can make a Big Paycheck everyday you make calls with Pace.

"WRITE ME TODAY FOR ALL THE FACTS!"

R. H. Rogers,
PRESIDENT

Read about the Big Checks other new Pacemen are regularly receiving—how quickly they learn our business with no prior experience. How PACE helps them every step of the way. See how one satisfied Pace customer tells another. Write us a letter or mail the coupon. You'll get "Same Day Action" with all the exciting facts upon which you can make an intelligent decision.

**SHOW ME HOW TO USE INFLATION
TO MAKE OVER \$500 ON SINGLE ORDERS!**



PACE PRODUCTS, INC.

81st & Indiana Dept. PM-280
Kansas City, Missouri 64132

Name

Address

City State Zip



Time to test your skill.



Now you can build your own Mason & Sullivan heirloom quality, antique reproduction clock.

Over 20 different models available in do-it-yourself, pre-cut or semi-assembled form for all levels of skill. Grandfather, Grandmother, wall, desk, mantle and more. All solid 3/4" hand-matched kiln-dried hardwood in walnut, oak, cherry or Honduras mahogany. Imported precision movements and chimes. Solid brass dials. Clocks you'll find challenging to make and at a savings you can appreciate. So, if you're looking for the finest clocks around... don't waste another minute. Build a Mason & Sullivan. It's well worth the effort.

Send for our new 32 page catalog today.



☐ Please send me your new color catalog of top-quality antique reproduction clocks I can build.
☐ I enclose \$1.00 for catalog

Name _____

Address _____

City/State _____ Zip _____

Mason & Sullivan Co.

Dept. 1116 Osterville, MA 02655

HIGH FLYING THRILLS!

The amazing rotating airfoil

ROLL-O-KITE

\$5.00 each, 3 for \$13.50, 10 for \$25.00

The unusual design of this rapidly spinning airfoil causes strong lifting forces in the wind. A GREAT FLYER! Quick, easy to assemble without glue or tools. 17" wide, 7" diameter. COMPLETE KIT includes fittings, instructions, 100 yards of flying string — all handsomely boxed for gift giving.

\$5.00 each, 3 for \$13.50, 10 for \$25.00

Calif. residents add 6% tax

Hawaii, Alaska, Puerto Rico, Mexico, Canada & any USA rush orders, add \$1.50 per order for air shipment. All other countries: minimum order 10 for \$30.00 — boxed & shipped by sea, prepaid.

Send check or Money Order to:

RAFCO, Dept. PM-20

3136 Kashiwa St., Torrance, CA 90505

THE ORIGINAL BASEMENT TOILET

Genuine Porcelain

FLUSHES UP TO SEWER OR SEPTIC TANK

-No Digging Up Floors-
INSTALLS EASY. ANYWHERE!

Write **McPHERSON, Inc., Dept. PM**
Box 15133 Tampa, Florida 33684



WHAT IT'S LIKE TO FLY THE M.I.T. PEDAL-POWERED BIPLANE

(Continued from page 121)

ning M.I.T. model rocket club and had a lot of model-making experience. They designed the plane in about a month last winter.

All the principals signed up for the same special projects course under Prof. Eugene Larrabee. They received about \$2500 to build the plane. Of that, about half went for aluminum tubing for the airframe. The tubing presented a problem: with .02-inch walls, it was too thick! A one-day chemical milling operation was set up to eat away metal to the required .013- to .018-inch thickness.

Despite a seemingly endless variety of obstacles, first construction to first flight took only 91 days. (Example: They couldn't find Styrofoam sheets thin enough, so Parks had to invent a special cutter.) As many as 30 different volunteers worked long hours, sometimes as much as 18 hours straight, to assemble the craft. One wing-covering session lasted three days. "We lived on Coca-Cola the whole semester," said Bruno Mombrinie, a volunteer.

One of the keys to *Chrysalis's* success was the shape of the propeller. Hyong Bang, one of the principals, wrote a computer program based on Prof. Larrabee's design equations and used it to find the most efficient configuration. The 14-foot prop weighs only 3 pounds. More interesting, perhaps, is that the English Channel-crossing *Gossamer Albatross* used the M.I.T. group's prop design, as well. According to Parks, it was one of several factors crucial to *Albatross's* achievement. There was a lot of interchange of ideas between the two groups; MacCready's basic design concepts were the starting point for *Chrysalis*. Parks says both *Albatross* and *Chrysalis* evolved from *Condor*, but developed in different directions.

On June 5, 1979, on its first attempt, *Chrysalis*, piloted by Youngren, flew successfully. The 30-foot flight lasted 15 seconds at a height of about three feet. Since then, the craft has flown more than 350 times without major mishap. In fact, *Chrysalis* has weathered so many landings (and crashes) so well that most of the excess aluminum tubing thought to be needed for repairs was never used.

True to the intent of its builders, *Chrysalis* has been flown by a wide variety of pilots, most of them with no special training. Men and women from 18 to 60 years of age, ranging in weight from 100 to 200 pounds, have flown. Youngren has made the most

spectacular flights, often reaching a 36-foot altitude and staying aloft for a few minutes at a time.

My flights

A disappointingly gray dawn broke over the Hansecom Field airstrip and my stomach churned as we wheeled the plane out of its hangar. It was so big, and yet so light—just a 96-pound model airplane. I wondered if I could fly it without destroying it or myself, or both. I served as a wing stabilizer with the ground crew and rang along as Bang took *Chrysalis* up for a brief shake-down flight. Then it was my turn.

I climbed into the Mylar-covered cockpit and tried not to step anywhere but on the pedals; one slip and my foot would shoot through the fragile balsa and Styrofoam structure. Seat "adjustment" was simple—Bang stuffed several foam pads behind me until I felt comfortable. In front of me a small meter told me my pedaling speed. "Just keep the meter pinned and you'll be okay," I was told.

Strapped to the pedals and mushed into the foam padding, I listened carefully to a quick lecture about the control stick. Pull back to climb. Pull left if veering right. Pull right if veering left. Don't pull too hard. And—oh, yes—make sure to keep pedaling. My heart quickened with each instruction.

Bang sealed me in the cockpit; I began to pedal slowly. The ground crew was in position, and Bang raised the tail. "Pedal faster!" he yelled as he began to push the plane forward. "Now, smoothly, POWER!"

In seconds I was pedaling close to 80 rpm and the plane surged ahead. Suddenly the wings were out of everyone's reach—I was airborne! The transition had been butter-smooth. I was so excited I stopped pedaling long enough to lose most of my altitude; a burst of effort brought me up again, but now I was veering right. I pulled left much too hard on the stick and swung too far left. My legs were tiring quickly, so I slowed down. The plane landed almost as smoothly as it had risen.

As I gasped for air, I was quickly surrounded by crew members congratulating me on my flight. Tired but exhilarated, I asked, "How high was I?"

"Oh, your wheel was maybe four or five feet up," came the reply. I was surprised and crestfallen. Only five feet! It had felt like 15 or 20. I later learned that everyone experiences the same illusion.

My first flight had been a good one, but it had been difficult to get the feel of the controls and remember to keep pedaling all at once. Armed with a firmer grasp of the necessary flight techniques, I felt certain I could vastly improve my flight.

Easier, with practice

After a good rest, I took off again, this time pedaling over 100 rpm—the meter was indeed pinned. Carefully husbanding the controls, I climbed higher and higher. With a better feel for the stick, I flew much straighter. My legs flagged briefly, but I summoned hidden reserves to keep going. Finally, I could pedal no longer. I settled to the ground, spent.

But it had been glorious! Despite the frenzy of pedaling, the flight was smooth, even peaceful. The beating of the propeller and my own grunts were the only sounds.

I'd been aloft for 63 seconds and had traveled about a quarter of a mile about 20 feet above the ground. Bang approached and congratulated me again. "You're among the

group of elite pilots," he exclaimed.

That puts me in pretty good company, I'd say. Bryan Allen, powerplant of the *Gossamers*, has also flown *Chrysalis*. He said it was a more stable plane; he probably could fly it a lot farther than I could, too.

The future

Despite the euphoria induced by the day's flying, there were some disappointments. After my last flight—the one in which I snatched a safe landing from a sure crash—the prop shaft sheared and the prop fell off just after takeoff. It was the only major damage sustained during more than 350 flights, although Parks says it could have been fixed in a day. But the plane was scheduled to be dismantled that weekend anyway, because there would be no place to store it.

Also, we'd had no opportunity to make turns in flight; the appropriate runway was crowded with the Air Force Thunderbirds and a C-5A.

The future of human-powered flight seems bright, however. Parks,

Youngren, and John Langford, another principal, now work for Lockheed in California, about 40 miles away from Paul MacCready's group. There is talk of a joining of forces to design the next generation of planes. A brief glimpse of a rough drawing showed what looked like a cross between *Gossamer* and *Chrysalis*—a monoplane with puller prop and rear tail.

The goal is to make the plane easy to assemble and disassemble, so a large hangar isn't needed for storage. There's a chance such a plane, whatever its configuration, would be made of graphite tubing and would be available in kit form in a couple of years or so.

But it takes a well-trained athlete like Bryan Allen to keep one of these birds aloft for an appreciable length of time; *Gossamer* required 0.25 to 0.3 hp to stay up and *Chrysalis* needed 0.4 hp. How could a less athletic person do it?

The answer may lie in low-cost solar cells and an electric motor. With a solar assist, pollution-free, human-powered flight for everyone may become reality. **FM**

If you like a Chevy Pickup,



you'll love it with Tilt-Wheel.



"Tilt-Wheel's really great in my Chevy pickup!"
Larry B. Malles
Fort Wayne,
Indiana

Tilt-Wheel is available on all GM light-duty pickup trucks. Tilt-Wheel means easy in and easy out. And, it helps fit the truck to you. You can put the wheel

where you like it for driving. Tilt-Wheel makes a big difference for a small price. Ask for a demonstration, the next time you go to buy a GM pickup.



**Saginaw
Steering Gear
Division**

Get a grip on your work ...instantly



...with new "Jaws" woodworkers clamp, the quicker gripper. Simply slide movable, ratchet arm along the notched steel beam, then tighten to fit the work. Serated jaws hold flat, round or tapered work pieces. Jaw on sliding arm floats to accomodate shape of workpiece. A novel ratchet system makes the jaws easy to position, even in the most confined areas. Throat depth is an ample 2 3/4".

In two largest sizes, *both* arms are movable. They can be reversed to exert outward pressure, similar to a spreading jack. The most useful, lightweight, versatile clamps we have ever seen.

For Credit Card orders, call anytime, toll-free 800-243-9844. In Conn., call 203-375-4629. For all other orders, mail coupon today.

PLASTIC GETS TOUGH

(Continued from page 112)

where it gets in the way if you happen to be a lefty.

Du Pont's Zytel ST, a nylon resin, is being stamped into one-piece, five-spoke bicycle wheels. It's lighter than aluminum and, according to the venerable chemical company, tougher than steel. (The ST stands for "supertough.") A Du Pont spokesman said the company has aggressive plans to market Zytel ST and other hard-to-crack chemical materials in applications where metals can't even compete—possibly in pipes carrying exotic fuels for advanced spacecraft, for instance.

Supercomposites have already entered the plumbing market, although they haven't yet won full acceptance from plumbing professionals and consumers. "Plumbing is a very traditional industry," says James Beltz of Celanese. "It takes 7 to 10 years' faultless performance to convince the industry to adopt plastics." That experience is building now.

Celanese uses an advanced polymer called Celcon for faucets and bathroom fixtures. Its selling points: It withstands 180° F. and 1000 pounds of water pressure and comes in "decorator" colors. Its weakness: I've found that if you use abrasive cleaners on composite fixtures, you can scratch away the finish. Composite plastic is a bit harder to clean than porcelain, and a sticky film develops when it is cleaned in hard water.

Walls of composite

Houses of the future may use composites extensively behind the walls. And if present trends continue, the walls themselves may be made of composites.

Two new composites in particular show promise for home construction. One, a special cement combined with a secret polymer and reinforced with a fiberglass fabric, is called Tapecrete. Two Canadian engineers developed it to prevent the destructive freeze-thaw cycle on Canadian highways. Successfully tested on Toronto bridges, Tapecrete is useful for surface repair for swimming pools, driveways, sidewalks and walls. Compared to concrete installed six months later, a 2-year-old Tapecrete test patch on a New York City sidewalk was far less worn.

PPG Industries wants to replace wooden and plaster wall construction with its fire-resistant, lightweight, fiberglass-reinforced product, Envirez. According to Factory Mutual Test Center experiments,



The Fine Tool Shops, Inc., Carriage Hill, Westport, CT 06880
Dept. PMF8

Please send the following "Jaws" Instant Action Clamps. If I am not satisfied in every way, I may, within 30 days, return for complete refund, including round-trip postage.

Quantity	Size	Price, Ea.	Quantity	Size	Price, Ea.
_____	6"	\$6.70	_____	30"	11.60
_____	12"	7.60	_____	36"	12.60
_____	18"	8.40	_____	Extra Pair of Jaw Pads	.50
_____	24"	9.25			

☐ Send new 96-page color CATALOG OF FINE TOOLS. Free.

Add \$1.50 for one item, and 35 cents for each additional one except the extra pads, for shipping and handling. Conn. residents add 7% sales tax.

Charge my _____ American Express _____ Visa _____
Enclosed is my check for \$ _____ MasterCard (Bank No. _____)

Account No. _____ Expires _____

Name _____

Address _____

City _____ State _____ Zip _____

Envirez walls have a smoke rating of 50 compared to polyester's 500. Wood's rating is higher yet. Envirez panels may not be in your home for a while, but you can look for them in schools and aboard new passenger jets.

'Bread and water' cars

Probably, you'll first become familiar with supercomposites in your future automobile. After downsizing, the best way for Detroit automakers to meet stiff federal mileage regulations by 1985 is to put the "fat" American steel car on a "bread and water" diet of supercomposites and aluminum.

Frank Daley, who is General Motors' manufacturing development director, says composites are fuel efficient. A steel car-fender liner, he says, weighs 13 pounds, aluminum 5 pounds, and composites 6 pounds. To manufacture and carry the part for five years takes the energy equivalent of 14 gallons of gas for the steel liner, 10 for aluminum, and only 7 for composites.

The aluminum industry questions the figures supporting composites' superior energy conservation. A recent Aluminum Assn. report, comparing lifetime energy require-

ment of aluminum, steel or composite auto hoods, says that the aluminum hood saves nearly 43 gallons of gas compared to a steel hood, compared to 7 gallons for a composite hood.

"The plastic hoods have only one life cycle," an association spokesman explains. "Aluminum can be recycled into new parts again and again for only a fraction (about 5 percent) of the energy required to make parts the first time." And he points out that plastic can't be used to make every part of the car. There will still be a role for aluminum—in engine blocks, for instance.

The steel industry isn't letting composites and aluminum steal the field, either. A U.S. Steel spokesman notes that new, inexpensive, high-strength steel will contribute to car-weight reduction. "One of our advances reduces weight and corrosion," the spokesman says. "One side of the high-strength steel sheet receives paint while the other side has been galvanized to prevent rust." So steel foresees it will maintain its competitive position during the 1980s.

Despite the competition from metals, supercomposites have already begun to appear in cars as "structural components"—body panels,

wheels, bumper beams and radiator supports. Until recently, they had been confined to noncritical parts such as doorknobs and display panels. Now, Ford has placed plastic hoods weighing 35 percent less than metal ones on 60,000 1980 Econoline Vans, and is testing 1000 carbon-fiber airconditioner brackets. GM is considering a plastic station-wagon tailgate.

Celanese and PPG have married fiberglass and carbon fiber with new resin and new winding techniques to make the composite driveshaft. A composite driveshaft is one 17-pound piece; in steel, it weighs 40 pounds and comes in three pieces. The composite shaft requires one production cycle, while the metal shaft may require 20 different steps, plus assembling the pieces. The composite shaft must be replaced if it tears. But its makers say the composite shaft is stronger and more resistant to damage.

If the plastic industry is right, the car you buy a decade from now will carry a lot of composite parts. Fancy polymers will also strengthen your driveway, house walls and appliances. And—if the industry is right—you'll never miss the metal replaced by tough new plastics. **PM**



FREE Drafting Aptitude Test You Grade Yourself!

Discover if you have ability for drafting—send for free Aptitude Test plus Drafting "Career Kit." No cost or obligation! No salesman will call. Drafting requires no special drawing skill or technical ability. Everything you need supplied with course—plus easy-to-follow, step-by-step lessons and personal guidance from our instructors.

READ WHAT 2 OF OUR BEST STUDENTS SAY!

We are proud of these comments sent to us by students when we asked them to evaluate our course. They may or may not be typical, but show what can be done by those who set their goals high and go after what they want.

SALARY INCREASED BY 56%. "Upon earning this diploma, I was made senior draftsman and my salary increased by 56%. I owe such an achievement to North American School of Drafting and its wonderful staff."

Mr. Elrie Farrell

MAKES UP TO \$200 A WEEK. "The training I have gained from North American School of Drafting has enabled me to work independently. I am now an assistant architect of Summit Development Company, and make up to \$200 a week. The course was very helpful to me."

Mr. Capeland Moxey

North American School of Drafting
4500 Campus Dr., Dept. PB010, Newport Beach, CA 92660

Men! Women! Learn at home in spare time with no previous experience.

Be a DRAFTER!

3 BIG DRAFTING KITS INCLUDED WITH COURSE

When you train at home with us for a job in Drafting.

In addition to your full course of instruction, training aids, supplemental textbooks and personal consulting, you get this beautiful drafting outfit that includes sturdy, adjustable tilt-top drafting table with board, drafting tools—including T-square, paper, etc.... plus valuable drawing triangles, lead holders, sharpener and quality steel precision drawing instruments in attractive lined case.





TRAIN AT HOME!

For "spare-time" study, there's no place like home! No schedules, no time lost going to class or "getting ready." Everything is always at your fingertips. Go at your own pace. Learn more **FASTER...** because you're a "class of one!"

Get Into a Career Where Pay Has Been GOING UP!

Salaries for draftsmen climbed 23% during the 3 years from 1973 to 1976, according to 1977 survey of 12,000 draftsmen by American Institute for Design & Drafting. Graduation from this course does not insure that you will get a job. To find out how our graduates have done, send for our job placement record. And because opportunities vary from one area to another, check the job market in your area and see how many jobs are available in the field of drafting.

RUSH COUPON FOR FREE "DRAFTING CAREER KIT."

Color Brochure, "Careers in Drafting"—jam-packed with revealing facts on opportunities in drafting and how to train at home in spare time...plus, valuable 5-way Drafting Instrument. Everything sent free and without obligation.

MAIL COUPON TODAY

Accredited Member, National Home Study Council Careers by Home Study

NORTH AMERICAN SCHOOL OF DRAFTING, Dept. PB010
4500 Campus Dr., Newport Beach, CA 92660

Rush aptitude test and drafting career kit...**ALL FREE**
No salesman will call. Check here for GI or VA ☐

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

APPROVED FOR VETERANS

LIQUIDATORS OF INVENTORY

NOW YOU CAN BUY DIRECT FROM A LIQUIDATOR!

Begin your own wholesale business or purchase the products for your own use. Bailey Sales Corporation, Liquidators of Inventory, offers Giant savings to you, not by large volume buying or cheap imports. Our method is simple! We buy excess and bankrupt inventory from companies all over the U.S. Many items can be purchased from us below manufacturing cost alone. Pictured below are just a few of the hundreds of items which appeared in a recent publication.



Tubeless Rib Tire & Wheel
Assy. 15 x 6.00-6
Sug. List \$29.95
Our Price \$13.95 Ea.
10 Or More \$11.95 Ea.



Toro Trimmer-Edger
Sug. List \$69.95
Our Price \$29.95 Ea.
10 Or More \$24.95 Ea.

Bosch Spark Plugs
Sug. List \$1.49 Ea.
Our Price \$.59 Ea.

Hydraulic Cylinder
Double Acting 2500 PSI
Bore 4" Stroke 16"
Sug. List \$169.95
Our Price \$79.95 Ea.
10 Or More \$69.95 Ea.



Lawn Mower Blades
Sug. List \$4.69
Our Price \$1.49 Ea.
10 Or More \$1.00 Ea.



Mini Bike Clutch
Sug. List \$22.95
Our Price \$8.95 Ea.
10 Or More \$7.95 Ea.



12 Volt Lawn & Garden Battery
Sug. List \$41.95
Our Price \$20.95 Ea.
10 Or More \$18.95 Ea.



Onan 18 H.P. Twin 4 Cycle Engine
Sug. List \$729.00
Our Price \$389.00 Ea.

The catalog that you receive is sent to over 40,000 manufacturers, distributors, and wholesalers within and outside the U.S. These products are offered to you and are listed in a monthly publication, "LIQUIDATORS OF INVENTORY." These items are constantly changing every month. If you are in business and your products relate to lawn and garden, motorcycles, tools, agriculture, all types of industrial and wholesale items, this catalog can be an asset to your company.

Bailey Sales Corporation offers volume buying with substantial discounts to wholesalers and manufacturers. It's also a great opportunity to get into the wholesaling business. Check our prices above; they tell the story. Buying at these prices you can make money.

Fill out the handy order blank below and send for your "LIQUIDATORS OF INVENTORY" catalog today for \$13.50 per year. Outside the U.S., \$27.00 per year.

Bailey Sales Corporation

BOX 127
CORUNNA, MI. 48817

☐ ENCLOSED IS MY CHECK OR MONEY ORDER FOR \$13.50 for ONE YEARS SUBSCRIPTION ☐ OUTSIDE U.S. \$27.00

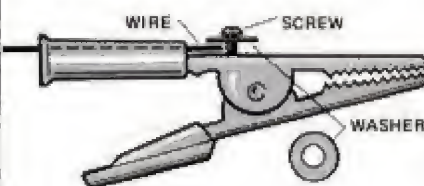
NAME _____ PM

ADDRESS _____

CITY _____ STATE _____ ZIP _____

HINTS FROM READERS

Washer holds wires



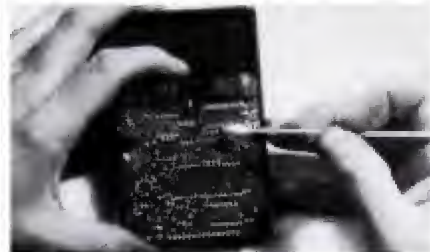
Many hobbyists or repairmen use alligator clips to join a component or wire in a circuit, temporarily, but wires tend to slip from the screw—especially the less-flexible wires of resistors and capacitors. Put a thin metal washer between wire and screwhead to widen the contact area and strengthen its hold.—*R. Krishnaswamy*

Keeping components neat



Any builder of an electronic kit knows how important it is to keep parts neat. A cardboard lid and scrap of Styrofoam plastic can make a good parts organizer. Styrofoam is used to half-fill the lid. Resistors and capacitors are then put in order. The other half of the lid can hold switches or controls.—*Ken Patterson*

Remove leaking fluid



Do you still get wrong answers on your pocket calculator—even after replacing the battery? If so, check for leakage from an exploded cell. The fluid can cause metal parts to corrode or, worse, short out the printed-circuit board. Remove fluid with a cotton-tipped applicator.—*Arden Bomeli*



INFLATION FIGHTER
Assemble 16 hp. Big Wheel Tractor Kit for yourself or resell for profit. Factory direct savings. 30 attachments — 67" mower, plow, loader, backhoe, snowblower, etc. Catalog 50¢. Build-it-Yourself Plans \$7 (refunded on any purchase). Struck Kit, Dept. PM20T Cedarburg, Wis. 53012

NO MORE BACKACHES!

Rugged Bluebird Cultivator

CUTS TIME AND WORK

Powered Wheels — Simple Controls
Power-oscillating tines (Pat.)
Throws no dirt on seedlings
Works close to plants
Eliminates weeds — easily

MONEY-BACK

WARRANTY.

Unit includes: depth control,

fold-down handles, oil, wrench,

B Briggs & Stratton engine,

shipping box.

DIRECT FROM FACTORY.

Brochure Free

PRECISION VALLEY MFG. CO.

Box 9112 Springfield, VT 05156

Henry Morgan says: "If NRI can turn me into an appliance repairman, think what they can do for you!"

Did you know that there are over a billion appliances in use in the United States today? And three repairmen. At least that's the way it seems when one of mine goes on the blink. With more than two dozen electrical gadgets in my house going snap, crackle and pop, I finally got tired of trying to locate a guy with enough ambition to take my money and I decided to learn how to make the repairs myself.

When a well-aged comic like me decides to go back to school, you can bet the family jewels it won't be back at P.S. 93. I'm going to learn at home, or not at all. So I sent away for NRI's home-study course in Appliance Servicing... and I took the course.

With a mechanical aptitude slightly below that of King Kong, I needed a course that started at the beginning and didn't move ahead too fast. Well, NRI did just that. They started with electricity — what it is and what it does — and went from there. You proceed at your own rate of speed. Whip through it if you want to, or take your time. What counts is the fact that you learn, in a way that it sticks with you.

You learn to repair appliances — from food processors and microwave ovens to refrigeration and air conditioning equipment — the real professional way. It's the kind of training you need to be a pro or a really hot-shot do-it-yourselfer. If NRI can turn old ten-thumbs Morgan into a reasonable facsimile of a repairman, think what they could do for you!

NRI's no fly-by-night outfit. They've been training people for more than sixty-five years...and they've had over a million students. It's the oldest and largest home-study school in the field of electronics and electricity, so they know it better than anyone else around.

The NRI course is really easy to understand...with lots of pictures to show you what they're talking about. They even send you the tools you need at no extra cost. Depending on which level of training you select, you'll get professional hand tools, test meters, and demonstration equipment that lets you see the circuits you've been reading about.

In just a few months, you'll be fixing your own appliances like I do. Then, you'll move ahead into bigger stuff like washers, trash mashers, garbage disposers, freezers, solid-state controls, and more — the heavyweight professional training, all in "bite-size" lessons to make it as easy as possible for you.

Take my advice and mail the postage-paid



card for a free catalog describing the courses, tools, and lessons in detail. Even if you don't know which end of a screwdriver is the handle, they can give you the training to become a professional repairman and appliance technician. NRI's training is one of the few things I've ever sent for that was even better than they said it would be. The NRI catalog is free and there's no obligation. No one will knock at your door or bug you at home. NRI doesn't use salesmen. They don't need them.

Take it from Henry Morgan, the appliance repair field could sure use some good men. Now, if somebody else beat you to the postcard, write to NRI at the address below.

Henry Morgan

Other Opportunities from NRI.

Small Engine Repair

Learn to service and repair lawn mowers, garden tractors, chain saws, tillers, outboards, mopeds, motorcycles and other small engines. NRI training includes professional tools...inductive tachometer, volt-ohm meter, torque wrench, valve spring and ring compressors and more. And you learn by doing, actually building a 3-1/2 HP engine as part of your training. Choice of Basic and Advanced Courses. Check postcard for catalog.

Air Conditioning/ Refrigeration/Heating Including Solar Technology

Covers entire field, including lessons on solar heating, heat pumps, etc. Course is complete with professional tools, including top-grade professional vacuum pump, key to the proper servicing of refrigeration and air conditioning

units. Two courses to choose from. Check postcard for free catalog.

Auto Repair and Servicing

NRI "hands-on" training covers what you need to know from headlight to taillight. Includes professional tools like inductive timing light, ignition analysis and tune-up instrument, vacuum test pump, and the latest advance in diagnostic instruments, a digital read-out tune-up analyzer. Approved by Richard Petty, America's winningest stock car driver and NRI automotive consultant. Choice of two courses, check postcard for catalog.



NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016



(Continued from page 137)

You can buy cabinets ready-made, have them custom-built or make them yourself. For basic cabinet-making plans, see *How to build your own kitchen cabinets*, page 141, Apr. '78. Screw cabinets to wall studs af-

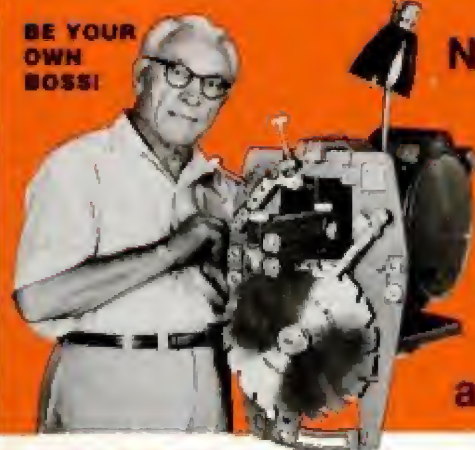
Once the cabinets are rigid, cut the plywood or particleboard panels for the desk top, notching for studs if necessary. Glue and nail a pine strip for the front edge to each panel.

apply it beforehand. Start at front edges, cutting the laminate strips 1/8-in. oversize so they can be trimmed with a flush-trimming carbide router cutter. Then bond the laminate to the top surface, again cutting the piece slightly oversize and trimming afterward.

(Please turn to page 182)



BE YOUR
OWN
BOSS!



Now you can cash in on the huge demand
for SHARPENING SAWS and TOOLS.

Make \$8⁰⁰ an hour...

or more. Work part time, full time, right at
home. No layoffs. No strikes. Provides
a steady source of year round income.

Head What These Foley Shop Owners Say:

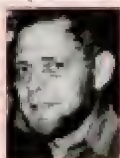
Shop will gross \$40,000 ...

... likes being independent

"I worked in various industrial jobs for years, and always wondered if I could make money for someone else, why I couldn't do it for myself. So after losing my regular job, I opened my Foley sharpening shop in the basement of my home. I only had a minimum of cash to start with, but Foley financed the balance. My shop will gross over \$40,000 this year, and I like the feeling of running my own shop without answering to someone else."

William Wescott

Willoughby, Ohio 44094



**Husband and
wife have a
going spare
time shop**

"I'm a construction foreman, and my wife is a nurse's aide. Our Foley shop fits in nicely with our regular jobs, and we earn extra money. Our sons help out too, so ours is a real family business."

"I'm still too young to retire, but when I do I'll have a very good business built up. Foley equipment helps us to do good work and brings customers back with more jobs on a regular basis... we have a lot of repeat business the year around."

Victor Kosloski

Sturgis, Michigan 49091



**Glad he
chose Foley
for his saw
shop**

"I worked as a carpenter all my life, but when a back injury forced me to quit I decided to go into sharpening full time. I'm very proud of my shop and glad my choice was Foley equipment... it is superb. I made over \$48,000 last year, and this year it will go more than \$50,000."

Victor Johnson

Lincoln, Nebraska 68507

This can be one of the most important decisions you ever make

Going into business for yourself can be the most exciting and rewarding decision you're likely to make in your lifetime.

Owning your own business brings you a sense of independence. You're the boss, setting your own work hours. Your own effort builds the business for yourself and your family. You can achieve great satisfaction and profits, if you choose and manage your business wisely. That's why so many men, just like you, are cashing in on the big profits to be made in this fast-growing service field.

The sharpening business allows you to get started with only a minimum investment, requiring little space and effort for a successful operation. It lets you build and expand as fast, or as slowly as you like. You pocket most of the money you take in, because there are exceptionally high profits with no investment in merchandise.

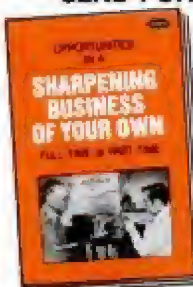
If you need only \$200 or \$400 extra income each month, a sharpening business is ideal for spare time. The additional dollars can be SPENT for more of the good things of life. Or they can be SAVED in a rainy-day fund that the family can bank on.

More sharpening businesses are needed every year

As original equipment continues to climb in cost, owners are becoming more concerned that the equipment be maintained so that it performs like new. This means more companies, contractors, carpenters and home owners are having their old saw blades and tools resharpened many times, where in the past, they would have replaced them with new blades or tools. This is where you

can step in with the much needed service of sharpening saws and practically any kind of tool.

SEND FOR FREE FACTS TODAY!



**This FREE
booklet has
helped
thousands**

Thousands of good men have been inspired by this fact-filled book into making that first important step of starting their own

business. It can be yours just for the asking.

It covers these important subjects...

- How much money can you make
- Age, education not a factor
- No selling is required — customers bring their business to you
- Lawn mowers and chain saws
- Sharpening business is year-round
- Sharpening opportunities in small towns and large cities
- A sharpening business provides excellent retirement income
- How Foley helps you start
- No experience needed, any age can succeed

Act today, so you can have a brighter, more secure tomorrow

Right now, while this is still fresh in your mind, fill-in the coupon below. We will send your FREE copy of "Opportunities in a Sharpening Business of Your Own". There is absolutely no obligation and there are no franchise fees in starting your Foley Sharpening Business.

Send your name and address to: Foley Manufacturing Co., 3201 Foley Building, Minneapolis, Minnesota 55418

CLIP OUT AND MAIL THIS COUPON TODAY — OR CALL TOLL FREE 1-(800)-328-7140,
(Except in Hawaii or Alaska). 24-HOUR ANSWERING SERVICE.



**FREE
BOOKLET**

This little book has helped change the lives of thousands of good people, just

like you. Just complete the coupon, clip it out and mail it to us today. Get started now for a brighter, more prosperous tomorrow!

Foley Manufacturing Company
3201 Foley Building
Minneapolis, Minn. 55418

Foley

☐ **YES**, I would like to receive complete details about how I can easily start a profitable, Foley-equipped sharpening shop. Please rush me your FREE booklet, without any cost or obligation, that gives me full details on how I can quickly start my own business.

NAME _____

ADDRESS _____

CITY _____

STATE _____ **ZIP** _____

AREA CODE _____ **PHONE NO.** _____



FREE BLUEPRINTS and TRIAL LESSON —for your greater success in Building

Beginners, craftsmen, even foremen and superintendents, have sent for these free blueprints and trial lesson in Plan Reading as a means of trying out Chicago Tech's home-study Builders training. See how you can learn Plan Reading, Estimating and the practical details of all types of construction in your spare time at home. Mail coupon or phone TOLL FREE today for your free ranch home blueprints, trial lesson and catalog on CTC Builders training.

• PHONE TOLL FREE (24 HRS.)
1-800-528-6050 Ext. 810

CHICAGO TECH/School for Builders
2000 S. Michigan Avenue, Chicago, Ill. 60616

CHICAGO TECH/School for Builders
Dept. PM-20 2000 S. Michigan Ave.,
Chicago, Ill. 60616

Please mail me a Free Trial Lesson, Blueprints and Builders Catalog. I understand there is no obligation—no salesman will call.

NAME _____ AGE _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

Veterans
Check
Here ☐

If You Need

Super
Quick

RUBBER

Anytime
Day or Nite

STAMPS

CALL Toll Free 1-800-547-8678

Underground Homes



□ **The Primer To Earth Sheltered Living** — 24 Page Booklet gives basic information on underground homes — advantages, site selection, planning, financing, building tips, construction and landscaping. 83.00 ppd.

□ **Plans For The Future** — 44 Page Book features full color renditions of 25 different underground home designs, plus floor plans. Blueprints available. 86.95 ppd. Order Today! Satisfaction Guaranteed.
Underground Homes • Dept. PM2
229 Masonic Bldg. • Portsmouth, OH 45662

MIRACLE TOMATO Yields 2 BUSHELLS To A Vine



Now—You can grow the world's most amazing Tomato right in your own garden and get from 2 to 3 bushels of delicious, ripe tomatoes from every vine. Tomato grows 16 to 20 ft. high. Huge,

BURGESS CLIMBING TRIP-L-CROP

meaty, solid fruit, wonderful flavor. Some weigh as much as 2 pounds. Unsurpassed for canning and slicing. Blight free — drought and disease-resistant. Grows any place. Outyields all other varieties.

TRIAL PACKET 10¢
Postpaid. Order Today!
Jumbo Packet 25¢

Write for FREE complete Catalog listing many unusual Seeds, Plants and Bulbs even if you don't order tomato seeds. Order Cat. No. 56711

BURGESS SEED & PLANT CO.
DEPT. 4951-68
905 FOUR SEASONS ROAD
BLOOMINGTON, IL. 61701

HOW TO MAKE ROOM AT THE TOP

(Continued from page 180)

cabinets with corner braces or by screwing up through cabinet corner brackets. Then build plywood dividers and enclose back and top of the recess with plywood. To make skinning recess easier, screw recess back to the desktop prior to sliding the top into position. Apply plastic laminate to dividers. Paint top and back of recesses. Install a multiple-outlet strip and light fixtures.

Recessed floor/ceiling lamp

Removal of the stairway shaft partitions created a perfect spot for a through-the-floor fluorescent light. This provides subtle under-lighting for showing off plants and a night light for the stairs and room below. The ½-in. plexiglass will support 150 lbs. Access to bulbs is through a sliding plexiglass panel.

Prefab fireplace slate hearth

Since the fireplace unit we selected has a 7-in. clearance from the floor, noncombustible floor material beneath and around it was a must. We used slate tiles set in a 1-in. bed of mortar over a ¼-in. sheet of asbestos millboard. To build such a hearth, nail asbestos millboard and a layer of wire mesh to the floor. Use 2x2s to build form for mortar at sides. Experiment with tile patterns and make a dry run before mixing mortar. Then shovel a mixture of 1 part mortar mix to 1 part sand mix into form to a depth of 1 in. Level and smooth the mix and tap slate lightly into position using a hammer and wood block. We used a simple brickwork pattern with ⅝-in. spaces and worked from front to back, starting with full-width tiles. The mortar mix should be thick to keep tiles from settling too low. If they do, put some mix under them and retamp in place. Point space between tile using joint filler.

To cut tiles for fitting in the last rows, use a portable circular saw with a masonry cutting blade. Prepare a simple jig to hold two sides of the tile snug. Lay a piece of plywood on top to hold tiles in place and cut along exposed area about three quarters through for a clean break. Cut on the exposed side of tile.

Since we wanted to center the fireplace in the room, the chimney passes through the roof at the ridge. See framing details and the design for the custom-built ridge-flashing assembly in the plans. At the roof opening, a triple wall pipe circulates outside air around the inner flue to insulate and prevent ignition of nearby rafters.

PM

QUARTZ

BATTERY CLOCK
MOVEMENTS - NEW
LARGER
SELECTION
at the Lowest
Prices Ever
From KLOCKIT



QUARTZ #202 & 203

Dimensions 2 7/8" L x
2 7/16" W x 1" D.

#202 - for dials up to
1 1/4" thick.

#203 - for dials up to
7/8" thick.

Prices: For 1 Mvt. \$10.50.

5 mvts. \$8.75 ea.

10 Mvts. \$7.65 ea.

Free Hour & Minute Hand!

Second hand 5-300 — 35¢ ea.

Shipping Extra.

- Pendulums!
- Dials!
- New "Mini-Quartz"
- Numerals!
- Chime Movements!
- Wt. Shells!

Add: Shipping & Handling:
1 unit \$1.50, 5 units, \$2.00

PHONE ORDERS WELCOME!

SAVE with #154

American made 4 jewel
Battery Clock Movement
Free Hr. & Min. hand -
Low prices: 1 Mvt. \$6.95
5 Mvts. \$5.85 ea. 10
Mvts. \$5.40 ea.
For dials up to 1 1/4" thick -
long shaft available - at
slight extra cost, shipping
extra.

For a Free Catalog - Write KLOCKIT, P.O. Box 629 • Lake Geneva, WI 53147
or Call: (414) - 245-6902 - [For 1st class catalog delivery - send 50¢]

Turn Extra Time Into Extra Income! Earn \$5 to \$8 an Hour

**Be your own boss
in a money-making
business of your own.**

**No
Experience
Needed**

Sharp-All

lets you

Sharpen Saws

garden and shop tools
for home and industry

Start Earning FAST—No Experience Necessary.

With SHARP-ALL it's easy to start your own business. No selling is involved, no inventory. People bring in their work... you take in year round CASH Profits and keep 90¢ out of every dollar you earn. Work sparetime or fulltime right at home in your garage, basement or tool shed. Work the hours you want—**FREE Book** tells how to start your own business even while working at your regular job.

Big PROFITS In Sharpening.

Every home and business has saws and tools that need periodic sharpening. There's plenty of business waiting for the man who can sharpen saws, planer knives, jointer blades, wood chisels, scissors, pinking shears, snips, lawn-mowers, axes and other garden, shop and home tools. SHARP-ALL does **ALL** these jobs and more... quickly, and at a big profit. You will be sharpening headquarters for carpenters, builders, lumberyards, factories, home work-shops and hobbyists... hundreds of jobs right in your own neighborhood.



It's EASY To Get Started—No Franchise Fees!

You don't have to invest thousands of dollars to get started in business for yourself. Low Cost SHARP-ALL and our 45 years of experience in helping sincere men earn extra income, *plus the desire to get ahead* is all you need. Fully Illustrated Operators Manual gives clear, step-by-step instructions, shows exactly how to sharpen each tool, where to get business, what to charge, how to get free advertising... all the "tricks of the trade". And, SHARP-ALL does the kind of precision job that brings customers back time after time.

Send for FREE Book "Lifetime Security." Do It Today!

**There is NO OBLIGATION and
NO SALESMAN Will Call!**

**ACT NOW!
Coupon
Brings
Full Details!**

SEND FOR FREE FACTS TODAY!

You risk nothing by accepting this offer to see how easily you can turn your spare time into Big CASH Profits with your own Complete Sharpening Shop. Send coupon or mail postcard for full details on our exclusive

30-Day FREE Trial Offer!

FREE Booklet gives full details—

Our Free Book tells how to start a profitable, lifetime home sharpening business, how we help you grow, how we'll finance you.

**Send for
your copy
today. No
obligation.**



No Obligation... No Salesman



BELSAW SHARP-ALL CO.
710F Field Bldg.
Kansas City, MO 64111



Please send my **FREE** copy of your book "Lifetime Security" and full details on your 30-Day Free Trial Offer!

Name _____

Address _____

City _____

State _____

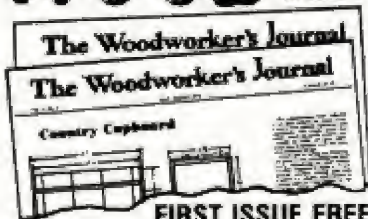
Zip _____

**FREE
BOOK**

**RUSH
COUPON
TODAY!**

BELSAW SHARP-ALL Co., 710F Field Bldg., K.C., MO 64111

IF YOU WORK WITH WOOD GET...



FIRST ISSUE FREE

When you subscribe to the next 12 issues of the Woodworker's Journal. Each issue is filled with actual plans and patterns, shop tips, money-making ideas, antique repairing and cabinetmaking techniques.

**OVER 70 PLANS & PATTERNS
FEATURED EACH YEAR.**

Whether you're a novice or a veteran you'll enjoy every page of detailed instructions for all types of practical woodworking projects. Build fine Early American, Shaker, Contemporary Furniture, Toys, Gifts, Clocks, Lamps and much more.

**SUBSCRIBE
NOW**

1 YEAR (6 Issues)—only \$7.00
2 YEARS (12 Issues)—only \$12.00
Foreign Rates—Add \$2.00 Please
make payment in U.S. Funds

GUARANTEED: Full refund on all unmailed issues
if not completely satisfied

Send Check or M.O. to:
THE WOODWORKER'S JOURNAL, Dept. 512
P.O. Box 1629, 25 Town View Drive,
New Milford, Ct. 06776

☐ 6 Issues—\$7.00 ☐ 12 Issues—\$12.00

Name

Address

City State Zip

SPARE TIME INCOME? SELL KNAPP SHOES!

Sell famous Knapp Cushion Comfort Shoes full time or part time to supplement your income. Enjoy the financial success and security you've always dreamed about. Millions of repeat customers. Earn higher commissions plus bonuses. No investment. Free selling and training kit to get you started. America's No. 1 company in the direct selling shoe industry. Write: Knapp Shoes, Dept. L 612 Knapp Centre, Brockton, Mass. 02401.



KNAPP

The more for the money shoe.

QUICK START

**250
AMPS
12 VDC**

100%

STARTER and Charges Too

Weights only 15 1/2 lbs.
Easy! Just Clamp to
Battery and Plug into 120 V Outlet.

Quick Start Will Start your Engine in Seconds.

Only \$97.50 and we pay the freight.

GREAT PLAINS PRODUCTS

P.O. BOX 82632 Olathe City, OK 73146 PM

NEXT MONTH IN PM

- **Minisubmarines take on big underseas jobs.**
- **New camping gear goes backwoods with the RVs.**
- **Annual garden and outdoor living guide.**
- **Vacuum gauge—an economy driving tool.**

SUBSCRIPTION SERVICE: Popular Mechanics Magazine will, upon receipt from its reader of a complete new or renewal subscription order, undertake fulfillment of that order as to provide the first-copy delivery to the Postal Service within six to twelve weeks. If for some reason this cannot be done, you will be promptly notified of the issue date that will begin your subscription, with a request for any further instructions you may have concerning your order. Please address all such orders to us at Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. Should you have any problem with your subscription, please write Joan Harris, Customer Service Department, Popular Mechanics, P.O. Box 10064, Des Moines, Iowa 50350. To assure quickest service, please enclose your mailing label when writing to us or when renewing your subscription. Renewal orders must be received at least eight weeks prior to expiration to assure continued service.

Popular Mechanics

P.O. Box 10060, Des Moines, Iowa 50350

YES!

Please enter my subscription to **POPULAR MECHANICS** for:

- ☐ 1 year \$8.97
☐ 2 years \$16.97

Payment of \$ is enclosed.

Bill Me initial here

Name (please print)

Address

City State Zip

Your first copy will be on its way to you in six to twelve weeks. Watch for it!

A publication of The Hearst Corporation
Charge orders subject to publisher's acceptance
(Above prices apply in U.S. & Possessions only. All other countries add \$6.00 per year.)

CHANGING ADDRESS?

If you're planning to move, please let us know at least eight weeks before changing your address. Attach current address label and fill in your name and your new address. This will serve to insure prompt service on your subscription.

Send old label with your name and new address to:
POPULAR MECHANICS

P.O. Box 10064, Des Moines, Iowa 50350

FOR CHANGE OF ADDRESS ONLY

CALL TOLL FREE 800-247-9479

(State of Iowa residents call 800-532-1272)

For any other subscription inquiries, please write Joan Harris, Customer Service Dept., **POPULAR MECHANICS**, P.O. Box 10064, Des Moines, Iowa 50350.

NAME (Please print)

NEW ADDRESS

CITY STATE ZIP CODE

HANDSOME BENCH YOU CAN BUILD

(Continued from page 129)

piece should be ripped 1/8 in. wider than necessary to allow for planing and joining. Plane the edges to allow a sliver of light to show at the center. When they have been glued and clamped, this will assure a tight fit at the ends.

Shaping the seat

After the planks have been joined, cut the ends of the seat to conform to your drawing. Round the corners and scoop out the seat, using a 1-in. gouge and block plane. Test frequently with a cardboard template and use 80-grit sandpaper for the initial sanding. Finish the sanding step with 120-grit paper.

On the bottom of the seat, lay out the locations of the legs (H and I). Use the appropriate sight gauges to bore holes. Next, cut the rails (D). When you cut the tenons, pay particular heed to angles at the tenon shoulders to be sure you have a tight fit.

Mortises in legs can be cut with mortising attachment on your drill press, or by grouping bored holes to mortise dimensions and chiseling out the waste. Use the V-block jig, shown in *Try These Two Projects from A. Lincoln, Handyman* (page 118, Feb. '79), to hold the legs to proper angle while mortising. Also bore the holes in the legs for the rungs (E). Trim the tenons to fit the mortises.

Build bench from bottom up

To assemble the seat and legs, prepare plastic resin glue and glue legs to seat, rungs to legs, and rails to legs. Clamp to hold all parts in position and to square rails to rungs. Allow the completed assembly to stand for 24 hours before continuing. Then cut the leg bottoms at the proper angle and length.

With the bottom half assembled, proceed with parts for top half. Start by propping arm with cut-off pieces and make bores. A light pencil line on the side of the arm will help you to align the bit with the required angle.

Rest the assembled lower half of the bench on a full sheet of plywood, shimmed, leveled and fixed on the shop floor. Then locate and bore holes in the seat top, using a portable drill and sight gauge.

Cut away excess stock from the ends of the three posts (K). Finish shaping with a spokeshave and wood rasp. Then, sand with 100-grit, 150- and, finally, 180-grit paper.

Cut the top rail (B) to length and

(Please turn to page 186)

**PUBLIC NOTICE!
BANKRUPTCY**
and Financially
Distressed Merchandise!

We are authorized liquidators of large inventories that must be quickly sold at sacrifice prices because of a variety of reasons such as:

Manufacturers' overproduction
Last year's models
Bankruptcy
Sheriff's sale
Bank loan foreclosure
Insurance claim sale

If your company finds itself in any situation that requires it to sell large inventories for immediate cash, call us! Only products in perfect operating condition . . . or slight blemishes that do not affect operating performance . . . will be considered. Call toll-free: 800-328-5082.

MUST LIQUIDATE

AT FAR BELOW DEALER COST!

3-Speed, Horizontal & Vertical

3/4 hp. 6" BAND SAW

Heavy-Duty for Steel, Iron, Copper, Wood, Plastic, etc.

CUTS STEEL UP TO 4 1/2" ROUND, UP TO 4" X 6" RECTANGULAR!

Here's a big, rugged, heavyweight band saw with plenty of power to slice through steel up to 6 inches thick! It saws easily through any shape stock — flat, bar, square, channel, tube. Use it to saw lumber, plastic, copper, brass, aluminum, iron, with proper saw blade. Comes with a standard 1/2" blade, 65" long. Blade rides on big 7 1/2" bandwheel.

For horizontal cuts, you can vise-lock work in position and walk away. Automatic shut-off turns off machine when cut is completed. Tension control spring adjusts quickly to feed blade at proper rate of speed for smoothest cutting. It cuts in vertical position, too, so you can slit, notch or cut contour shapes! An ideal cutting tool for your workshop!

- 1 Cuts up to 4 1/2" round stock; up to 4" x 6" rectangular stock.
- 2 3/4 hp. capacitor start motor gives plenty of power. Three-prong plug fits 110V outlet.
- 3 Steel and bronze gears; worm gear drive for smooth, long-lasting performance.
- 4 Easy adjustment for blade tension.
- 5 Adjustable roller guides; ball bearing thrust guide to keep blade rigid for most effective cutting. Prevents loose blades that break.
- 6 Heavy duty stand for firm, sturdy support.
- 7 Heavily ribbed cast iron saw bow for mass weight and rigidity plus reinforcement.
- 8 Heavy duty metal work stop lets you repeat same length cut, time after time.
- 9 Handy tool shelf with slight V-shape to keep tools from falling off.
- 10 Head support allows for quick work change without lifting saw head all the way up.
- 11 Equipped with NEMA 55 motor frame.
- 12 Easy access for change of blade.

Includes 18-page operating manual!

\$470.00 value!

NOW . . . while they last:

\$198

AMERICAN
EXPRESS

master charge

VISA

Credit card customers can phone their order:

Toll-Free: 800-328-5082

In Minnesota, call collect: 612-729-2345

C.O.M.B. Co.

THE NATION'S LARGEST AUTHORIZED MAIL
ORDER LIQUIDATOR OF CONSUMER PRODUCTS
3258 MINNEHAHA / MINNEAPOLIS, MN 55406
Phone: 612-729-2345 Toll-Free: 800 328-5082



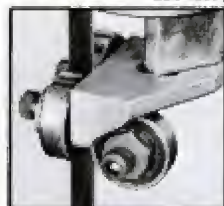
1 Year Parts Warranty!
Factory new! Sealed
in original cartons.

SIZE:
38" wide,
13 1/2" deep,
38" high
with head
down (55 1/2"
with head
in vertical
position.

Ship. wt.,
approx.
160 lbs.

Quick change of V-belt for
three speeds: 65, 120 and
220 feet per minute.

The heavy duty vise is hand-
wheel operated for fast setup.
Easily angled for miter cuts.



Blade guide arm adjusts for
size of work, gives maxi-
mum rigidity to blade for
squareness and accuracy.



Idler bandwheel mounted on
pivots for alignment adjust-
ment, accuracy and proper
blade travel.

**Converts Quickly
to Vertical Jig Saw
With a Handy Cutting Shelf!**

The saw head tilts back for use as a vertical jig
saw! A handy cutting table is included. You can
notch, slit or cut contour shapes using the shelf
for support. It's like having two saws in one!

C.O.M.B. Co. / Authorized Liquidators Dept. 178
3258 Minnehaha Avenue S., Minneapolis, Minn. 55406

Send the 3/4 hp. Heavy Duty Band Saw for only \$198.00. I will pay shipping charge to the
driver upon delivery. (Allow 2-3 weeks for delivery. If paid by personal check, allow addi-
tional 1-2 weeks for check to clear the bank.)

☐ My check or money order is enclosed.

Charge to: ☐ Mastercharge

☐ VISA

☐ American Express

Account No. _____

Expires _____

PLEASE PRINT CLEARLY

Name _____

Address _____

City _____

State _____

ZIP _____

Phone _____

SAVE HEATING DOLLARS

HOT PIPES
Converts 38" of 3" flue pipe, 19" of 8" flue pipe into a finned heating radiator.
Installs in minutes, no tools needed.
\$6.95 plus \$3.95 shipping.
WIL-MOR, INC. Dept. C
P.O. Box 30182
Cleveland, Ohio 44130 Ohio residents add 5% Sales Tax.



Order Eyeglasses by Mail and Save.



Yes, prescription glasses (or your present lenses duplicated) by mail and at big savings. As low as \$14.95—frames, lenses, and case! Satisfaction guaranteed. Write for free catalog.
All lenses, all styles.
Prism Optical, Inc., Dept. PM20
10992 N.W. 7th Ave., N. Miami, FL 33168

USE THOSE BABY FOOD JARS

SnapCaps attach to 4 1/2" pegboard to hold your baby food jars. Provide neat, visible storage for small shop items, sewing and craft supplies & SnapCaps—\$1.09 36 SnapCaps—\$2.50 72 SnapCaps—\$4.00 144 SnapCaps—\$6.00 Post paid, no C.O.D. Check or money order.
WICKLIFFE INDUSTRIES
Box 286, PM-20
Wickliffe, OH 44092



NEW
NEW
NEW
NEW
NEW

THE WATERFRONT EQUIPMENT AND HARDWARE STORE
Tools, Drills, Bits, Saws, Planes, Nails, Plank, Mooring Arms, Floating Docks, Boat House Kits, Electric Motor Control, Deck Ladders, Mooring Hooks, Trailer Accessories, Lawn & Pool Furniture.
1049 Annapolis Street • Annapolis, MD 21401
Quality Boat Handling and Waterfront Equipment
NEW CATALOG
\$4.95 plus \$3.00 Postpaid FREE DELIVERY



LEARN MEAT CUTTING

Train quickly in 8 short weeks at Toledo for a bright future with security in the vital meat business. Big pay, full-time jobs—HAVE A PROFITABLE MARKET OF YOUR OWN! Time payment plan available. Dismissals given. Job help. Thousands of successful graduates. OUR 5th YEAR! Send NOW for a big new illustrated FREE catalog. No obligation. G.F. approved. NATIONAL SCHOOL OF MEAT CUTTING, No. 71-02-0197, Dept. 50-7, 33 N. Superior, Toledo, Ohio 43604.

NAME THAT TUNE!

OVER 100 TUNES AVAILABLE FOR YOUR OWN MUSIC BOX CREATION!
Send Money order from \$8 to \$25 apiece from \$1.50 Disc. Eggs with over 90 music favorites to choose from. Guaranteed for 1 year. Send \$1.50 for catalog with tune selection (refundable).
WORLD OF MUSIC BOXES
412 Main St. Aven. New Jersey 07717 Dept. 8



Make Money in SCREEN Printing HOME BUSINESS!

Print without a printing press! Signs, bumper stickers, T-shirts, banners, posters. Print on paper, plastic, glass, wood, metal, fabric... almost any surface... every color of the rainbow... for stores, restaurants, mail order, factories, politicians, etc. Easy home-study course starts you fast. We show you what to do, how to do it... guide you step-by-step. Send name, address, age for free facts.
SCREEN PRINTING CENTER, 4401 Birch St., Dept. PM019, Newport Beach, CA 92663

At Last a New Amazingly Simple GAS TURBINE JET ENGINE

Build from easy to follow plans.
Length 18", Dia. 6 1/2", Wt. 15 lbs.
Fuel: Gasoline or Kerosene.
"Screaming Demon" develops 20 H.P. Ideal project for serious-minded hobbyists, students, scientists and industrial attachment. For use on small racing boats, model cars, etc. Full size assembly drawings with critical dimensions, list of materials and photos. Price \$7.95. No. C-3-D.
SAVDY SCIENTIFIC
1910 26th St., Box 1386
SANTA MONICA, CALIF. 90406



WEEDHOPPER—ULTIMATE FUN MACHINE!



No licenses required on plane or pilot; 40 hour construction time; complete kit \$2695.00; carries 220 lb up to 50 mph! Send \$5.00 for info-pak to:
WEEDHOPPER OF UTAH, INC.
Box 2253, Ogden, Ut. 84404

LANDSCAPING

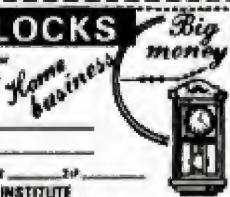
Growing demand—good income for trained Landscape Contractors and Garden/Nursery personnel. Start your own business part or full time or hobby. Home study course prepares you in 6 months. Certificate awarded. Free booklet describes opportunities. No salesman.
LIFETIME CAREER SCHOOLS Dept. A-843
2251 Barry Ave., Los Angeles, CA 90064



Name _____
Address _____
City _____ State _____ Zip _____

REPAIR CLOCKS

Home Study Course prepares you for Good Income—Professional Status. Free Details. No salesman will call.



CLOCKMAKERS INSTITUTE
P.O. BOX 448, LEWISTOWN, PA. 17044



STAINED GLASS

Send 50c for fascinating catalog of kits, tools, ideas, books and supplies.
BIG STARTER KIT
Only \$16.95 apd.

WHITTEMORE,
BOX 2065EM, HANOVER, MASS. 02339

An ATLAS BODY? In 7 days

my method of DYNAMIC-TENSION starts giving results you can feel and your friends will notice. Big, useful muscles. Gain weight, if needed. Lose "pot belly." Send your name and address for 32-page book—FREE.
CHARLES ATLAS, 49 West 23rd St., New York, N.Y. 10010 Dept. PB



BREW YOUR OWN FUEL

BROWN'S ALCOHOL MOTOR FUEL COOKBOOK
Contains step-by-step procedures for the making and using alcohol as a motor fuel. How to build your own home still, how to modify your car's carburetor to run on alcohol & other engine modifications to get up to 100 miles per gallon, & much more. Loaded with large clear photos, you'll be amazed at how easy it really is. Don't hesitate order your copy today!
Book No. 300... \$9.95 extra
BENNETT PUBLICATIONS
DEPT. PM—CORNVILLE, ARIZONA 86025

GARAGE DOOR OPENERS

• Radio Controlled
• Buy Factory Direct and Save
• Thousands in Use • Free Brochure
• Easy Homeowner Installation
• Immediate Shipment by UPS or PP
HELPMATE Equipment Co. Dept. PM2-80 Baroda, MI 49101

BE A CHIMNEY SWEEP

Your Own Business: A chimney sweep can clean a chimney with the August Weir System in one hour. Nationally, the average charge is \$40.00.

A Growing Need:
The energy crisis has resulted in a dramatic increase in wood burning. Wood smoke deposits from masonry creosote in chimneys. Regular cleaning is necessary to prevent fire damage.

The August Weir System:
More sweeps use it than any other method in the country.

Send for our free booklet, or call TOLL FREE any time and ask for "The August Weir Story."

800-648-5311 Ad for page 51

August Weir Systems, Inc.
Box 603 • Dept. PM4
Wardport, CT 06880



HANDSOME BENCH YOU CAN BUILD

(Continued from page 184)

cut tenons on both ends as per shop drawing. Lay out and cut mortises on both end back posts. Then notch the center post to accept the rail. Follow by laying out the 20 holes for the back stays (J). The holes should allow the pieces to slip in and out easily to facilitate the assembly process later.

Dry assembly

Next, round the arms with a rasp and scraper and sand when the proper contours are reached.

You are now ready for dry assembly of the arms and back. Expect some filing and trial-and-error matching until a good fit is achieved in all mating pieces. While the bench is dry-assembled, hold each end post tightly to the arm and bore the holes for brass screws. Then counterbore, insert screws and tighten, drawing the arms to the posts. Do the same to fasten the centerpost to the top rail. Disassemble.

Prepare for final assembly

Have a bucket of warm water and a cloth handy to wipe away excess glue. Begin by fitting and gluing the back posts and stays to the seat, then to the top rail. Secure with a band clamp. Glue and assemble the arms and their stays (F and G). Cover all screw heads with wood plugs cut to match.

Use band clamps wherever needed, especially in joining posts to the seat and to the top rail.

Finishing the bench

Allow the assembled unit to stand for 24 hours. Then, using the 180-grit sandpaper, sand all surfaces and break (round slightly) all sharp corners. Prepare all surfaces for staining by wiping with a tack rag. We used Minwax Ipswich stain for the finish shown in the lead photo on page 126.

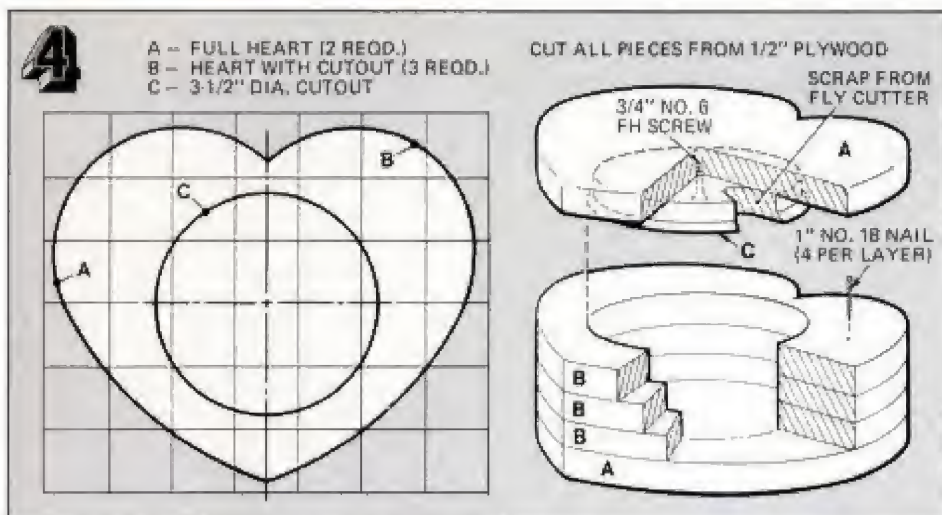
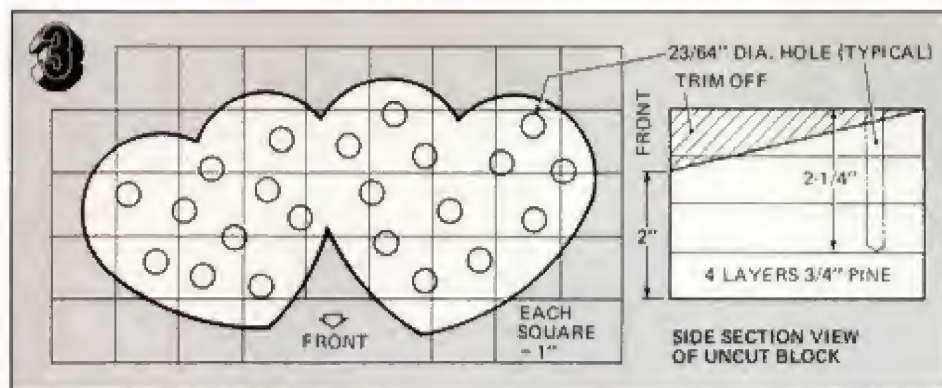
Allow the first coat to stand undisturbed overnight before applying the second coat. Again, allow overnight drying. Then apply a coat of orange shellac. After four hours, rub all surfaces with No. 0000 steel wool and wipe down with a tack rag before applying a second shellac coat. Allow this coat to dry completely overnight.

Finally, rub gently with No. 0000 steel wool and wipe down with tack rag. Polish with a clean soft cloth and Carnauba wax.

Your Lincoln settee reproduction is now complete and should become a treasured possession in your family for generations to come. **PM**

4 VALENTINES FROM YOUR SHOP

(Continued from page 124)



No complicated hardware is used to hold the mirror in a tilt position. Our version is designed with dowel "hinges" which are merely a force fit.

The mirror pretty much stays at the angle to which it is tilted. It will not, however, stand out at extreme angles (i.e., parallel to the base). The force-fit design works perfectly for any of the typical dresser-top mirror uses.

Beginning work on the mirror

Start by laying out the heart shape on either cardboard or 1/8-in. hardboard. Cut out the template and transfer the design to one of the pieces of plywood. Tack this piece to the second piece of plywood and then cut out both of them at one time, using either a scroll saw or a band-saw.

While the pieces are still tacked together, use a rabbet cutter in your router to cut the mirror-holding rabbet. Once you've gone this far, you can bring the cutouts to your local glazier and order the 1/8-in. mirror

MATERIALS LIST—CRAYON HOLDER

No.	Size and description
1	3 x 5 x 9" pine (or glue up blocks of thinner stock to desired thickness)

Misc.: Sandpaper, paint.

hearts. The glazier can't cut a perfect heart—as you can with wood—but he should cut it close enough so all rounded spots will be hidden in the rabbet when the halves are joined. Remember to sand all of the edges before you separate the hearts.

Cut the remaining parts for the stand and assemble, using glue and nails. Separate the tacked-together heart pieces and temporarily reassemble them as they will be when they hold the mirror. Using a pair of hand screws, clamp the heart in position with the stand. With the setup held rigid in a vise, bore the holes for the hinge dowels. Then make a test assembly and, when satisfied, permanently assemble the mirror.

Seal all parts and paint with acrylic paints using the color photo on page 125 as a guide. Seal with Krylon No. 1301 spray.

Ring caddy

Start by gluing up wood for the base (unless you have a suitably

(Please turn to page 194)

Free! Edmund Scientific Catalog

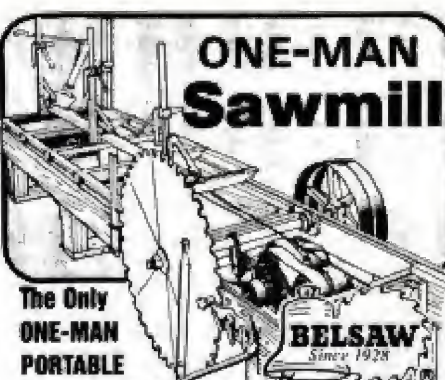


Explore Astronomy, Biofeedback, Optics, Lasers, Magnets, Weather, Magnifiers, Microscopes, Photography... Over 4,000 Fascinating Products in Our **FREE** 100 page color Catalog! Send for your **FREE** Edmund Scientific Catalog, Today! 38 Years Of Service!

☐ Yes! Rush me your **FREE** catalog!

Name _____
Address _____
City _____
State _____ Zip _____

Clip and Mail Coupon Today to:
Edmund Scientific Co., Dept. 2020 H-04
Edscorp Bldg., Barrington, N.J. 08007
No. 156 ©1980 Edmund Scientific Co.



The Only
**ONE-MAN
PORTABLE**

SAWMILL Of Its Kind In The World!

If you need good, high-quality lumber, don't let inflated lumber prices stop your important building projects. The Belsaw goes right to the trees and turns out smooth, true-cut lumber... even beginners get excellent results. Just one man (no crew needed) can easily cut enough on weekends to save hundreds of dollars over high lumberyard prices. For power use tractor PTO or other low HP diesel or electric unit. Factory-direct selling keeps price low, and convenient time payments may be arranged.

Send for **FREE BOOK!** Just mail coupon below for "How To Saw Lumber" booklet and complete facts on the One-Man Sawmill. There is **NO** Obligation and **NO** Salesman Will Call on you. **Do It TODAY!**

FREE BOOK

BELSAW MACHINERY CO.
3124 FIELD BUILDING
KANSAS CITY, MO 64111

Please send all facts and details in your **FREE BOOK** "How To Saw Lumber". I understand there is **No Obligation** and that **No Salesman** will call on me.

Name _____
Address _____
City-State _____ Zip _____

MATERIALS LIST—JEWELRY BOX

No.	Size and description
5	1/2 x 6 x 6" clear pine (or A-D grade plywood)

Misc.: Sandpaper, shellac, assorted spray paints, white glue.

Bargain Hunter

4 VALENTINES FROM YOUR SHOP

(Continued from page 193)

sized hardwood block in your scrap box). Do use hardwood for the base because you need its weight for stability.

Shape the block on the table saw, locate and bore cup-hook holes, sand, set aside. Lay out the hand on the 1/4-in. plywood and cut it out with a coping saw, scroll saw, sabre- or bandsaw. Sand all of the edges and surfaces and then seal them with shellac.

After checking parts for fit—remember that the hand should be "sloppy" in the kerf to allow for the flannel cuff—paint all parts, using the color photo on page 125 as a guide. When dry, assemble the caddy using glue.

Crayon holder

To get the desired thickness, I created a laminated block by gluing up four layers of 3/4-in. pine. Use carpenter's glue and clamps—no nails are needed—and allow the block to dry for at least 24 hours.

It is easiest to do a neat job if you bore the crayon-holding holes and cut the slanting front *before* cutting the hearts to shape. You can do the first on the drill press and the second on either a radial or table saw using conventional cutting techniques.

In case you should forget to cut the angle first, use a belt sander and coarse-grit paper to shape the slanted front.

Sand the holder smooth, dust and apply spray paint. Some paint will fill the crayon holes a bit; you may have to use a rattail file to bring them back to easy-fit crayon-holding capacity.

Jewelry box

You can use either 1/2-in. pine or plywood to make the heart layers. The former takes the paint better but the latter is stronger.

If you should decide to go with pine, you can increase its stability by alternating the grain direction of the hearts so each successive layer will have its grain at 90° to the one below it.

The three middle layers are cut out using a circle cutter (often called fly cutter) in the drill press. The cutter should be used with drill press at a slow speed and the workpiece must be clamped rigidly for safety. Set one of the circular cutouts aside for use as the cover's guide. This is simply glued and screw-fastened, using a single flathead screw.

Sand the box well, dust it off and then finish as per general instructions.

PM

KIT CARS



Annual Buyer's Guide
160 Pages
Over 500 Photos



ASSEMBLE & DRIVE YOUR OWN FULL-SIZE SPORTS CAR

For the low price of an ordinary compact car, you can own an authentically detailed MG-TD replica, a full-size Dino Ferrari look-alike, or a gull-wing Porsche-inspired street racer. Altogether, there are more than 100 stylish antiques, classic and modern coach reproductions known as "kit-cars." Virtually all are simple one-for-one bolt-on body replacements designed to fit a variety of popular everyday cars.

Now you can get all the important details about these practical do-it-yourself money-saving conversions with the newest, largest, most comprehensive super catalog ever published. *The Complete Guide To Kit Cars* gives you 160 fact-filled pages of information about these revolutionary automobiles that can be assembled for a fraction of their apparent value. This giant buyer's guide is packed with everything from 40 MPG roadsters to fire-breathing mid-engine V8's • All the models • All the Manufacturers • More than 500 photos • In-depth articles • Prices • Specifications • How-to features plus much more!

* 14 Day Money Back Guarantee *



☐ \$7 Postpd. ☐ \$10 Rush 1st Class
☐ \$11 Foreign Air Mail

Bill to my: ☐ Master Charge ☐ VISA

Send Today To: **AUTO LOGIC, INC.**
P.O. Box 2073, Dept. 703
Wilmington, DE 19899

Exp. Date _____

Signature _____

Name (print) _____

Address _____

City _____ State _____ Zip _____



Order TOLL-FREE by phone.
Master Charge or VISA REQUIRED!
(800) 331-1000 Day or Night.
(918) 664-8300 in Okla. call collect.

EARN BIG COMMISSIONS

WORK FULL OR PART TIME!

Show big FREE SALES KIT featuring complete line low priced business printing and ad specialties to business people. Build profitable repeat business. Start now.

NATIONAL PRESS, INC.
DEPT. 021 NORTH CHICAGO, ILLINOIS 60064



DRIED FLOWERS ARE 'IN'...

All your favorite flowers for dried arrangements are in Herbst Bros. FREE 72-page seed catalog. Send today.

HERBST BROTHERS SEEDSMEN, INC.

1031 N. Main St. Brewster, NY 10509 (914) 279-2971

Burglar-Fire Protection



Protect Your Life, Home, Business, Auto, etc.

• Our catalog shows how install your own alarm systems and devices and save \$\$\$\$\$. We offer FREE write-in engineering service.

FREE CATALOG

Lowest Prices to Retailers. High Quality Alarm Systems and Devices.

Burdex Security Co. Box 82802-PM Lincoln, Ne. 68501

NOW COMES IN 2 SIZES: PONY FOR SMALL GARDENS, HORSE FOR LARGE GARDENS.



JUST ONE HAND!

So easy to handle you guide it with just one hand. And now the Troy-Bilt Roto Tiller-Power Composter is yours in 14 1/2" and 20" tilling widths. For complete details, prices, off-season discounts, send coupon below for free booklet.

Troy-Bilt, 102nd St. & 9th Ave., Troy, N.Y. 12180

Troy-Bilt Roto Tiller-Power Composters, Dept. A23
102nd St. & 9th Ave., Troy, N.Y. 12180

Please send the whole exciting story of Troy-Bilt® Roto Tiller-Power Composters, including prices, specifications and off-season savings.

Mr. _____ (Please Print Clearly)

Mrs. _____

Miss _____

Address _____

City _____ State _____ Zip _____

START MAKING CHEAP "HOMEMADE FUEL."

STOP WASTING MONEY ON GAS.

Step-by-step instructions how to:

- convert your car's engine to operate on alcohol.
- produce your own cheap "Homemade Fuel."

Send only \$10.80 for the "Homemade Fuel" Book.

SEGO ENERGY

Box 1290A Palisade, Colorado 81526

110 VOLT A.C. GENERATORS

60 cycles, 3000 watts, WT. 27 pounds, 5" x 10" Fanbelt driven from car or pickup. Operates 110V. All power tools. Over 17,000 in service. This is our 30th year. Guaranteed 6 months, \$159.00. Our X1200-watt generator needs no battery. Special price \$159.00. Add \$6.50 for postage & handling, per unit.

VIRDEN PERMA-BILT Box 7160 PM
2821 Mays, Amarillo, TX 79109
Phone: 806/352-2761

TILLS & HOES & SAVES

KEEPS GARDEN CLEAN, PRODUCTIVE



Low priced, multi-purpose tiller/hoe. A joy to operate, 30-day home trial. Shipped prepaid (ex. AK, HI). Free information.

AUTO HOE,

P.O. Box W121A2, De Pere, Wis. 54115



SAVE HUNDREDS OF DOLLARS

Imagine yourself the builder of this attractive ALL PURPOSE BARN 24' by 36' by 18' high with easy to follow plans. Appealing to the eye in suburban, farm, ranch, lake area. Many uses as 3 or 4 car garage, boats, campers, store, lodge. Plans call for concrete floor, ceiling joist, plywood loft flooring, suggested window and door locations. Send \$10.00 for plans and material list. 24' x 36' HORSE BARN PLANS showing 3 stalls, tack room \$12.00. Send 50¢ for brochure and other projects to build.

HAMMOND BARN, Dept. PM002
Box 584, 3130 Hardware Court, New Castle, Indiana 47362.



WASTE OIL HEATER

For Shop, Garage, Warehouse and Farm

Waste Oil Worth 80¢ per gallon as a heating fuel

Pay Yourself not the fuel companies. Heat with any type of waste oil. LENAIR Waste Oil Heaters are a smart investment. Models 75,000 and 130,000 BTU Forced Air.

PROVEN • SMOKELESS • ODORLESS

WRITE
LENAIR INDUSTRIES INC.
P.O. BOX 1017-C
JANESVILLE, WI 53545
DEALER INQUIRIES WELCOME



PORTABLE ELECTRIC POWER

Build your own 110-Volt Electric Plant from used parts. Will operate lights, power tools, heating units, brush-type elect. motors, plus charge batteries and arc weld. Ideal for boats, campers and portable shops. Plans \$9.95 check or M.O. **CHAPALA CO.**

1020 E. Irvine, Dept. M, Tustin, Calif. 92680

COUNTERFEIT GUNS BLANK-FIRING (STARTER) PISTOLS

AUTHENTIC! FULL-SIZE MACHINED METAL PISTOLS CANNOT BE MADE TO FIRE REAL AMMUNITION. These blank firing pistols are NOT Imitations! No federal license required. Purchaser MUST be 18 years or older. Money back (less postage) if not satisfied.

SAME SIZE & WEIGHT AS ORIGINAL

**POLICE
.357 MAGNUM**

Length: 9.25" Weight: 2.2 lbs

U50-2061

U50-228C, Blank cartridges Box of 100

U50-2061 \$47.95

U50-228C \$4.95

ADD \$1.50 POSTAGE HANDLING TO EACH ORDER

UNIQUE IMPORTS, INC., Dept. PM020

800 SLATERS LANE, ALEXANDRIA, VA 22313

Send - U50-2061 - U50-228C - FREE COLOR CATALOG

Charge to: VISA MC AX CB DC

* LIST ALL NUMBERS ON CARD INCLUDE EXP. DATE:

NAME _____

ADDRESS _____

CITY / STATE / ZIP _____

MONEY BACK (LESS POSTAGE) IF NOT SATISFIED



BUILD YOUR OWN POWER TOOLS

SAVE \$20 TO \$300

METAL PARTS KITS AT LOW FACTORY DISCOUNT PRICES FOR:

• 12-IN. BAND SAW

• 18-IN. BAND SAW

• 4-IN. BELT SANDER

• SPINDLE SHAPER

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

• CORNER DRILL PRESS

• 10-IN. TILT/ARBOR SAW

Heats 25-48 hours on just 1 gallon of fuel! THE SUPER BLUE FLAME PORTABLE KEROSENE HEATER

Similar heaters sell
for \$100 — ours only
\$42⁹⁵

- Saves fuel dollars!
- Non-electric!
- No odor!
- No smoke!
- Doubles as cooker and humidifier!
- No chimney venting!



CHEAP HEAT!

- Kerosene heat is the most inexpensive supplement to permanent household heat.
- Turn your thermostat down & turn your Blue Flame Heater on in just the room you are in!

Our 12,000 BTU kerosene-burning space heater keeps a large 12' x 18' room comfortably warm. Raises temperature of smaller 12' x 15' room by approximately 50°F! Supplies intense, even, quick-starting heat. Economically heats colder rooms — or garage, workshop, basement, cabin, boat, greenhouse, etc. One gallon of kerosene burns 25 hours on highest flame, up to 48 hours on lower setting. A FRACTION THE COST OF ELECTRIC HEATERS! Depending on flame height, burns full 7/8 to 18 hrs. per 3 pt. tank full — a long time without refueling!

Top functions as cooking surface and humidifier (moist air retains heat). Has air-cooled coil handle, wide no-tip base, corrosion-resistant fuel tank, fuel gauge. Lightweight (approx. 5 1/2 lbs.), portable. Can secure in one place. Baked enamel. 19 1/2" high x 11 1/2" diam. at base. Wick cleaner included. Wick lasts approx. 3 months if used daily. (Extra wicks \$4.95 ea.). SUPER HEATERS: One for \$42.95, two \$83.90, three \$122.85. Add \$3.50 per unit shipping & handling. N.J. Res. add 5% sales tax. Master Charge & Visa welcome. ORDER TODAY!

DORSAY, 142 MacArthur, Dept. 275,
Garfield, N.J. 07026. (201) 544-5507.

(Dealer
Inquiries
Invited)

30-DAY NO-RISK GUARANTEE

You must be fully satisfied with your Blue Flame Heater, or return it in 30 days for a refund. No questions asked.

CREDIT CARD CUSTOMERS MAY
CALL TOLL FREE TO ORDER —

24 hrs. a day, 7 days a week

DIAL 1-800-241-0604

(In GA. 1-800-282-7418)

ASK FOR
OPERATOR
111

DORSAY, 142 MacArthur Ave., Dept. 275,
Garfield, N.J. 07026. (201) 544-5507

Please send me _____ SUPER HEATER(S) #241
(one \$42.95, two \$83.90, three \$122.85)
Send _____ Extra Wick(s) #324 at \$4.95 ea.

Add \$3.50 per heater shipping & handling.
N.J. Res. add 5% sales tax. Enclosed is _____

Charge my ☐ MC ☐ VISA Exp. date _____

Signature _____

Name _____

Address _____

City _____

State _____ Zip _____

©1979 Dorsay

Fuel-Thrifty ATV's

It only takes
\$2710 to become
an exclusive MAX
All Terrain
Vehicle Dealer*



And that includes your vehicle
delivered to you Freight Free!

Get the Facts on the Fuel-Thrifty ATV
Write MAX, Dept. A-3, 60 Depot St.
Buffalo, N.Y. 14206 • (716) 855-2226

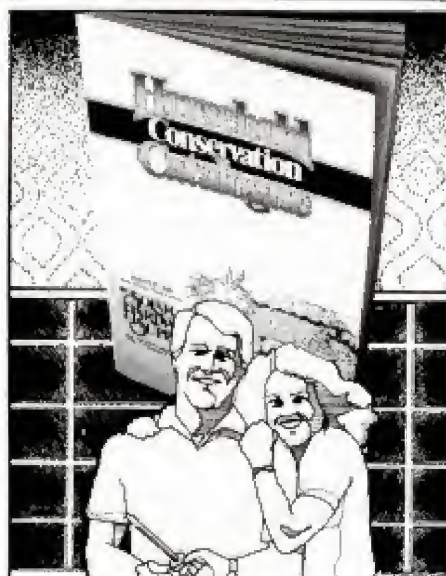
Name _____

Address _____

City _____

State _____ Zip _____

*If the territory is still open.
(YOU MUST BE 21 YEARS OF AGE)

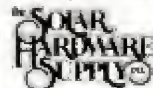


Give yourself a Housewarming.

The new Household Conservation Catalog
is full of products and ideas to help you
save money as you save energy — in every
room of your home.

From caulking to solar hot water, we've
got you covered.

Send \$1.00 (refundable with first purchase) to:



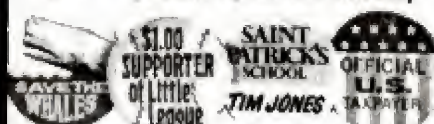
Dept. PM
2160 Clay
Denver, Colorado 80211

It's more than a catalog, it's an energy education.

The Consumer Sales division of Solar Technology Corporation

CHOOSE YOUR FREE BUTTON!

(OVER 1,000 CHOICES)



PROMOTE • RAISE FUNDS MAKE PROFITS • IDENTIFY

It's America's most
extensive line
of badge and button
making equipment.
Useful for clubs, schools,
business, individuals. Basic
kit contains hand die press,
color coded dies, badge parts
and illustrated instructions.
All for just \$24.95.



SEND TODAY

BADGE-A-MINUT, Ltd., Box 618, Dept. PM-20
Civic Industrial Park, LaSalle, IL 61301

☐ Yes, I want to choose my FREE Sample Button.
Send your 48-page color catalog.

☐ I'm convinced, send me the complete BADGE-A-MINUT system. I've enclosed \$24.95 plus \$1.75 postage. Ill. Residents add 5% sales tax.

☐ Use my credit card indicated below:

☐ VISA (BankAmericard)

☐ American Express

☐ Master Charge

Credit Card # _____

Inter Bank # _____

Exp. Date _____

Signature _____

Name _____

Organization _____

Address _____

City _____

State _____

Zip _____

UNCONDITIONAL MONEY-BACK GUARANTEE



WHAT'S THIS? PUT VENEER ON WITH AN IRON?

FREE: Send for free iron-
on veneering instructions
and colorful veneer craft
catalog today!

Announcing! Use new iron-on veneering technique
and Bob Morgan's wood veneers to create
beautifully veneered furniture quickly and easily!
Just put new hot melt glue sheet between veneer
and other wood surface. Then apply heat with an
iron. Veneer is ironed in place in only 2 minutes.
Guaranteed foolproof! Send now for free catalog.
Catalog lists 101 varieties rare veneers, needed
supplies, tools, and hot melt glue sheet at
reasonable prices. Bargain starter offers also
included. SAVE 25%. Hurry!

BOB MORGAN WOOD, DEPT. PO1K6
1123 Bardstown Rd., Louisville, Ky. 40204

INVENTORY ADJUSTMENT SPECIAL!

PILOT'S GLASSES AT UNBELIEVABLE PRICES!

ONLY
\$6.95



- Impact Resistant
- Handcrafted
- Polished Glass Lenses
- Hardened Metal Frames
- Money Back Guarantee

To order, send check or money order (include \$1.00
for postage and handling) to U.S. Optics, Dept. 306,
P.O. Box 14206 Atlanta, GA 30324. (Please specify
gold or silver frames.) SPECIAL: Order now and get
TWO PAIR for \$13 plus one dollar handling charge.

FREE! During this limited offer,
Deluxe velour lined protective case. A \$3.00 value.

LIMITED OFFER FROM U.S. OPTICS

3 BOOKS COUNT AS 1 SELECTION—972/982/993: 566 p.—Customizing Your Pickup; Fixin' Up Your Van on a Budget & Super Vans (\$15.85 paperbacks)

CUSTOMIZING YOUR PICKUP

FIXIN' UP YOUR VAN ON A BUDGET

SUPER VANS

HOW TO MAKE HOME ELECTRICITY FROM WIND, WATER & SUNSHINE

1128-252 p.—How to Make Home Electricity From Wind, Water and Sunshine (\$9.95)

Outdoor Projects For Home & Garden

1116-512 p.—Outdoor Projects for Home & Garden (\$12.95)

HOW TO PUT UP YOUR OWN POST-FRAME HOUSE AND CABIN

1154-378 p.—How to Put Up Your Own Post-Frame House & Cabin (\$12.95)

MAKING TOYS IN WOOD

2 BOOKS COUNT AS 1 SELECTION—318/915: 490 p.—Making Toys in Wood & The Build-It Book of Learning Playthings (\$18.90)

THE BUILD-IT BOOK OF LEARNING PLAYTHINGS

2 BOOKS COUNT AS 1 SELECTION—1084/1086: 1184 p.—Handbook of Home Improvements: Remodeling & Encyclopedia of Do-It-Yourself Projects (\$32.90)

THE FAMILY HANDYMAN HANDBOOK OF HOME IMPROVEMENT & REMODELING

The Family Handyman Encyclopedia of Do-It-Yourself Projects

1196-280 p.—Adding Solar Heat to Your Home (\$12.95)

ADDING SOLAR HEAT TO YOUR HOME

THE STONEWORKER'S BIBLE

1226-294 p.—The Stoneworker's Bible (12.95)

WORKING WITH PLYWOOD, Including Indoor/Outdoor

1144-364 p.—Working With Plywood, Including Indoor/Outdoor Projects (\$12.95)

DO-IT-YOURSELF'S GUIDE TO MODERN ENERGY-EFFICIENT HEATING & COOLING SYSTEMS

903/904: 566 p.—Guide to Modern Heating/Cooling Systems & Homeowner's Guide to Saving Energy (\$18.90)

Homeowner's Guide to Saving Energy

2 BOOKS COUNT AS 1 SELECTION—903/904: 566 p.—Guide to Modern Heating/Cooling Systems & Homeowner's Guide to Saving Energy (\$18.90)

1153-182 p.—How to Repair Clocks (\$9.95)

HOW TO REPAIR CLOCKS

SMALL APPLIANCE REPAIR GUIDE-Vol. 2

715/745: 406 p.—Small Appliance Repair Guide & The Home Appliance Clinic: Controls, Cycle Timers, Wiring & Repair (\$15.90)

THE HOME APPLIANCE CLINIC: Controls, Cycle Timers, Wiring & Repair

3 BOOKS COUNT AS 1 SELECTION—906/1036/1063: 552 p.—Homeowner's Guide to Solar Heating/Cooling; How to Cut Your Electric Bill & How to Install Your Own Home Mobile Electric Plant (\$13.85 paperbacks)

HOMEOWNER'S GUIDE TO SOLAR HEATING & COOLING

HOW TO INSTALL YOUR OWN HOME OR MOBILE ELECTRIC POWER PLANT

How to Cut Your Electric Bill and Install Your Own Emergency Power System

HOW TO BUILD YOUR OWN UNDERGROUND HOME

4772-512 p.—TWO BOOKS IN ONE BINDING—How to Build Your Underground Home & How to Build Adobe Houses... etc. (\$24.90)

How To Build Adobe Houses

THE COMPLETE LIBRARY OF METAL WORKING, SOLDERING & BLACKSMITHING

378-434 p.—The Complete Library of Metal Working, Soldering & Blacksmithing (\$24.85)

66 WEEKEND WOOD FURNITURE PROJECTS

2 BOOKS COUNT AS 1 SELECTION—974/1188: 840 p.—66 Weekend Wood Furniture Projects & 66 Children's Furniture Projects (\$23.90)

66 Children's Furniture Projects

1087-182 p.—How to Repair Briggs & Stratton Engines (\$7.95)

How to Repair Briggs & Stratton Engines

A step-by-step guide to understanding the big machinery, operation, and overhauling

1044-448 p.—The Woodturner's Bible (\$14.95)

THE WOODTURNER'S BIBLE

A complete guide to using a lathe, with stories of wood and woodturning projects

925-406 p.—Practical Electrical Installation, Repair & Rewiring (\$12.95)

PRACTICAL ELECTRICAL INSTALLATION, REPAIR & REWIRING

Illustrations, repair and rewiring for the home and shop

Facts About Club Membership

● The 6 introductory selections (up to 14 different books) of your choice carry publisher's retail prices of up to \$141.35. They are yours for only 99¢ for all six (plus postage and handling) with your Trial Membership. ● You will receive the Club News, describing the current selection, alternates and other offerings every 4 weeks (13 times a year). ● If you want the selection, do nothing; it will be sent to you automatically. If you do not wish to receive the selection, or if you want to order one of the many alternates offered, you simply give instructions on the reply form (and in the envelope) provided, and return it to us by the date specified. This date allows you at least 10 days in which to return the form. If, because of late mail delivery of the Club News, you do not have 10 days to make a decision and so receive an unwanted selection, you may return it at Club expense. ● To complete your Trial Membership, you need only buy four additional monthly selections or alternates during the next 12 months. You may cancel your Membership any time after you purchase these four books. ● All books—including the Introductory Offer—are fully returnable after 10 days if you're not completely satisfied. ● All books are offered at low Member prices plus a small postage and handling charge. ● Continuing Bonus: If you continue after this Trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates, plus payment of the nominal sum of \$1.99, will entitle you to a valuable Book Dividend of your choice which you may choose from a special list provided Members.

An Extraordinary Offer to introduce you to the benefits of Membership in

HOW-TO BOOK CLUB

take any **6** (UP TO 14 DIFFERENT BOOKS) of the selections on this page (values to \$141³⁵) for only **99¢** for **ALL SIX**

with a Trial Membership in the Book Club that guarantees to save you 25% to 75% on a wide selection of how-to books.

Let us send you your choice of 6 (up to 14 different books) of these practical book selections as part of an unusual offer of a Trial Membership in How-To Book Club.

Here are quality volumes, each designed to help you increase your know-how, save you money, and make your leisure hours more enjoyable. Whatever your needs, How-To Book Club offers books you can put to immediate use and benefit.

This extraordinary offer is intended to prove to you, through your own experience, that you can keep up with new books, and save while so doing! As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway... without the substantial savings offered by the Club.

To start your Membership on these attractive terms, simply fill out and mail the coupon today. You will receive the 6 selections (up to 14 books) of your choice for 10-day inspection. YOU NEED SEND NO MONEY! If not delighted, return the books within 10 days and your Membership will be cancelled without obligation.

HOW-TO BOOK CLUB, Blue Ridge Summit, Pa. 17214

HOW-TO BOOK CLUB

Blue Ridge Summit, Pa. 17214

Please open my Trial Membership in HOW-TO-BOOK CLUB and send me the 6 selections (up to 14 books) circled below. I understand the cost of the books I have selected is only 99¢ for ALL 6, plus a small shipping charge. If not delighted, I may return the books within 10 days and owe nothing, and have my Trial membership cancelled. I agree to purchase at least four additional books during the next 12 months, after which I may cancel my Membership at any time.

318/915 378 715/745 903/904
906/1036/1063 925 972/982/993
974/1188 1044 1084/1086 1087 1116
1128 1144 1154 1168 1196 1226 4772

Name _____ Phone _____

Address _____

City _____

State _____ Zip _____

(Valid for new Members only. Foreign and Canada add 15%.) PM-280

**You can have a happier life
— an excellent income
perform a service
everyone needs
— work part time or full time**

You can make good money from the growing demand for on-location cleaning. Every home and building are potential customers. Every customer represents repeat business. Clean carpet, upholstery and walls on-location using Von Schrader professional cleaning equipment, the finest of its kind. No special skills or experience needed. You can start part time with just one machine. As your business grows you can add the other two and thus offer a complete cleaning service. Equipment is light and portable. This is not a franchise. You pay no fees, dues or royalties. You own the equipment (amazingly small investment) keep all you earn. And we help you every step of the way. For 46 years we have helped thousands of users to enjoy a steady, growing business. We'll send you full information—learn how others became financially independent. So—take that first important step by mailing the coupon or call Toll Free



1-800-558-2484
(except in Wisconsin,
Alaska, Hawaii).

VON SCHRADER company

1020 Place, Racine, WI 53403
Send for information. (No salesman will call.)

Name _____
(Please print)
Address _____
City _____ State _____ Zip _____

**USE
ZIP CODES
WHEN
ANSWERING
ADS**

HOME-BUILT ALTERNATE ENERGY PLANS

Build these simple home systems from local parts & tools and enjoy FREE heat, light & power! COMPLETE PLANS: \$6.00 EACH, ANY 3 FOR \$15.00



3000 WATT WOODBURNING STEAM TURBINE. Convert wood to valuable Electricity! Includes Boiler & battery details. **2000 WATT VERTICAL SHAFT SAYONUS WINDTURBINE.** Offers simpler construction & efficiency than conventional windmills.

PORTABLE GASOLINE GENERATION SYSTEM. Uses Negative combustion to run any gas engine, even vehicles! Produces 1 liter gas equivalent from only 2 lbs. of wood! **2000 WATT DARRIEUS VERTICAL SHAFT ROTATING AIRFOIL.** Most advanced concept in Windpower! Offers high efficiency, low cost!

METHANE GAS GENERATOR. Produce Methane gas to heat & light city homes or farms from normally wasted resources! Cook with Methane & even run gas engines!

GLENVALE PRODUCTS Dept. PM2, Box 358 Station D, Toronto, Ontario M6P 3J9



Steuben?

No! Your glass, etched by you with **Armour Etch™** an exciting new do-it-yourself kit that revives the ancient art of etching. With it, you can create rich, permanently etched designs — as beautiful as collector's items — on any glassware, windows or mirrors. You won't believe how easy it is!

No art talent necessary
Just trace, cut, apply Armour Etch. Use our patterns or any that strike your fancy from magazines, newspapers, craft books, etc.

Now you can etch:

All Glass Windows, Mirrors,
Household Glassware,
Stained Glass, Lamps,
Fish Tanks, Terrariums,
Storm Doors, Auto
Glass, Fireplace
Doors, China
Cabinets.



Kit contains:
Armour Etch
Cream, applicator
brush, Armour Cleaner
Concentrate, hobby knife,
masking vinyl, reusable vinyl
gloves, step-by-step illustrated
instruction book. PLUS 45 full size
etching patterns.

only \$9.95

ARMOUR PRODUCTS PM20
Hill St., Midland Park, N.J. 07432, U.S.A.
Please send me _____ Armour Etch kits at \$9.95. Add \$1.00 for postage and handling. (New Jersey residents add 5% sales tax.)

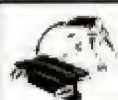
Name _____
Address _____
City _____
State _____ Zip _____

**PARKS 12" THICKNESS
PLANER**



The PARKS NO. 95 is a compact, modestly priced planer with mill planer precision and ruggedness. More than 40,000 in use around the world. Write NOW, for complete details!

THE PARKS WOODWORKING MACHINE CO.
Dept. PM, 1501 Knowlton St., Cincinnati, Oh. 45223
"Mfrs. of Quality Woodworking Machines Since 1987"



IF YOU USE A VISE - YOU NEED KANT-SCRATCH VISE GRIPS Created, tested and approved by expert mechanics for precision work! No slipping no "jiggling". Cannot scratch or mar the surface. Holds threaded and round material securely with perfect safety. Eliminates the damage to high polished or finished objects held in the vise. Sizes 3 - 3 1/4 - 3 1/2 - 4 inches - \$4.00. Sizes 4 1/4 - 4 1/2 - 4 3/4 - 5 inches - \$4.50. All taxes and shipping included. Allow 15 days for delivery. **FEST SPECIALTIES, 443 BREDA, WEST COVINA, CA 91791**

Laser 917. A Unique Sports Car Kit
FOR VW. FUN EASY TO BUILD.
Send \$3 for color brochure
Send \$29.95 for brochure
and assembly manual
Credit card ordering
CALL TOLL FREE 1-800-328-8898
Elite Enterprises Dept. PM2801
690 East Third St. Coonap, MN 55321

AUTOMATIC SAW SET
Set saw teeth automatically—100 per minute without effort. Perfect hammer and anvil action sets teeth uniformly—no tooth breakage.



FOR HAND SAWS AND BAND SAWS
Write for details
BURR MANUFACTURING CO.
8931 Venice Blvd.
Los Angeles, Calif. 90034

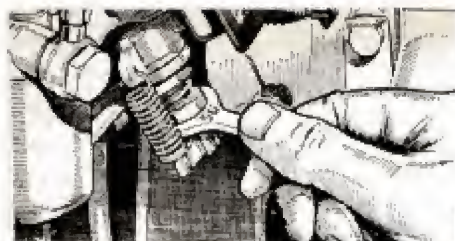
neova II VW HOVERCRAFT
uniquely different
land - water - 40 mph
info pack \$5
Plans \$11.95 available
NEOTERIC - USA - INC.
Troy, Maine, Indiana, Ill.
Ph. (812) 466-2303

**Wooden Toy
Patterns Catalog**

**OVER 200 DESIGNS
FREE PATTERNS & WHEELS
WITH CATALOG PURCHASE
ONLY \$1.00 REFUNDABLE**
Love-Built Toys & Crafts
2907 Lake Forest Rd.
P.O. Box 5459-133 Tahoe City, Ca. 95730

**IMPORTED
LOCK BLADE**
8" Overall Length
5" When Closed **\$3.50 Ea.**
• Sharp and
Tough
• Stainless
Steel Blade
Model #
K-12-AL
Not for sale in areas
where prohibited by law
Flips
open in
stantly and
locks auto-
matically to
prevent acci-
dental closing
Razor sharp
tough stainless
steel blade for re-
liable use and hard
long service. Send \$3.50
plus \$0.40 to cover post-
age and handling

WESTBURY SALES CO.
373 MAPLE AVE. Dept. L-2-PM WESTBURY, N.Y. 11590



Know your car inside and out.

Know how to fix it...to tune it...to service it...to keep it running right. The TOTAL SERVICE MANUAL for your car will show you how to do everything from a minor adjustment to a major repair.

factory workshop manuals. Each one is carefully rewritten for use by the do-it-yourself car owner. Clear and easy to follow, yet complete and detailed enough even for professional use. You get all the important information plus hundreds of the best pictures, diagrams, and specifications.

TOTAL SERVICE MANUALS are digests of official

TOTAL SERVICE MANUALS

SATISFACTION GUARANTEED OR YOUR MONEY BACK

1713	ALFA ROMEO 62-78 for all models	\$9.95
9641	ALFA ROMEO ALFETTA 73-78	\$9.95
9643	AMC AMBASSADOR 68-74 covers all models	\$9.95
9677	AMC PACER 75-77 covers all models	\$9.95
0990	ARROW PLYMOUTH 76-77 for all models	\$9.95
9404	ASPIN DODGE 76-78 for all models	\$9.95
7122	AUDI 100 70-77 for all models inc 100L	\$9.95
9684	AUDI 5000 77-78	\$9.95
8749	AUDI FOX 73-79 covers all models	\$12.50
0916	AUSTIN AMERICA 70-71 covers all models inc 1100, 1300	\$9.95
1203	AUSTIN HEALEY 100V6, 3000 56-63 for all models	\$9.95
0752	AUSTIN MARINA 71-75 sedan and GL models	\$9.95
0379	BARRACUDA & CUDA 65-72 at 6 & V8 models	\$7.95
0503	BUAZER CHEV 55-77 for all 2 & 4 wheel drive models	\$7.95
1007	BMW 1600 56-73 covers all models	\$9.95
1002	BMW 2000, 2002 66-76 covers all models inc CA, CS, 3.0	\$9.95
9823	BMW 320 75-78 covers all models	\$9.95
9760	BMW 2500, 2800, 3.0 41-42 models inc Base and CS	\$10.95
0883	BOBCAT MERCURY 76-79 covers all models	\$7.95
0504	BONOMO FORD 66-77 for all 2 & 4 wheel drive models	\$7.95
0024	BUICK 66-74 factory manual must give full year	\$7.95
0727	CADILLAC 68-74 all models except El Dorado	\$9.95
8678	CAMARO 67-78 covers all 6 & V8 models	\$9.95
9557	CAPRI 70-76 for all 2000, 2600, 2800 models	\$9.95
0379	CHALLENGER 70-72 covers all 6 and V8 models	\$7.95
8331	CHARGER 67-70 for all models inc 500 & R/T	\$7.95
8212	CHARGER 71-75 covers all models	\$7.95
0383	CHEVELLE 64-77 inc Malibu, Monte Carlo, El Camino	\$7.95
0638	CHEVETTE 76-78 covers all models	\$9.95
1038	CHEVROLET 29-40 covers all 6 cyl models	\$15.00
0988	CHEVROLET 49-54 reprint of factory shop manual	\$14.00
0051	CHEVROLET 55 or 57 reprint factory manual give year	\$19.95
8407	CHEVROLET 56 supplement to 55 manual	\$9.95
0870	CHEVROLET 68-77 for all full line models	\$7.95
8187	CHEVY II 67-77 covers all 6 & V8 models	\$7.95
0779	CHEVY LUV 77-77 covers all models	\$9.95
3661	CHEVY PICKUPS 67-78 for all models & GMC	\$9.95
1662	CHEVY VANS 67-78 for all models & GMC	\$9.95
1145	CHRYSLER 55-71 all inc New Yorker 300, New Yorker	\$9.95
0020	CHRYSLER 72-79 factory manual must give year	\$22.95
0588	CITROEN ID, DS 67-73 for all models 19, 20, 21	\$9.95
0939	CITROEN CX reprint of factory service manual	\$19.95
8264	COLT DODGE 71-77 covers all models	\$9.95
9422	COMET 60-65 covers all models	\$7.95
8211	COMET 70-72 covers all models	\$7.95
8212	CONQUEST DODGE 71-75 covers all models	\$7.95
0477	CONVAY 60-65 covers all models	\$9.95
0478	CORVETTE 57-65 covers all 283 & 327 models	\$9.95
9481	CORVETTE 66-76 covers all 327, 350, 427, 454 models	\$9.95
1756	CORVETTE PLYMOUTH 70-73 also covers Avenger	\$9.95
9440	DART & DEMON 65-67 covers all models	\$7.95
8188	DART & DEMON 68-76 covers all models	\$7.95
1657	DATSUN 110 76-78 covers all models	\$9.95
1164	DATSUN 200SX 77-79 covers all models	\$9.95
8665	DATSUN 1200, 8210 68-78 covers all models	\$9.95
8177	DATSUN 2400, 2602, 2802 70-78 covers all models	\$9.95
1551	DATSUN 510 68-73 covers all sedans & wagon models	\$9.95
1074	DATSUN 510 78-79 covers all models	\$9.95
9583	DATSUN 610 68-76 covers all models	\$9.95
0935	DATSUN 710 73-77 covers all models	\$9.95
8271	DATSUN 810 71-78	\$9.95
1258	DATSUN 811 1600 2000 SPL & SR models	\$10.95
9297	DATSUN PICKUP 68-77 covers all 521 & 620 models	\$9.95
1145	DODGE 55-71 all inc Coronet, Monaco, Polara	\$9.95
0871	DODGE 72-77 for all Monaco & Polara models	\$7.95
1259	DODGE DASH 78-79 covers all models	\$9.95
8208	DODGE RAMCHARGER 74-75 covers all models	\$7.95
9584	DODGE PICKUP 65-75 service manual at 2 wheel drive	\$7.50
8371	DODGE PICKUP 65-75 Service Manual at 4 wheel drive	\$7.50
8203	DODGE VANS 67-77 for all 100, 200, 300 models & Plymouth	\$7.95
8192	DUSTER 70-76 for all models inc Scamp	\$7.95
8189	FAIRLANE FORD 62-70 covers all models	\$7.95

9422	FALCON 60-64 covers all models inc Comet	\$6.95
9874	FALCON FORD 64-70 covers all 6 cyl models	\$7.95
0480	FALCON FORD 65-73 covers all 6 cyl models	\$7.95
9776	FIAT 124 67-77 all inc ign, sta wgn, TC, spdl	\$9.95
0844	FIAT 124 SPORT 76-78 for coupe & spider models	\$9.95
7118	FIAT 124 SPORT 55-75 for coupe & spider models	\$9.95
9640	FIAT 128 69-77 for all models inc SL & Rally	\$9.95
8742	FIAT 131 75-77 covers all Marlin models	\$9.95
1201	FIAT 850 64-74 all sedan, coupe & spider models	\$9.95
0399	FIAT 119 73-77	\$9.95
1073	FIESTA FORD 77-79 for all models	\$9.95
0875	FIREBIRD covers all models—67-74	\$7.95
1149	FORD 55-67 all inc Galaxie, LTD, Custom & wagons	\$9.95
0872	FORD 68-77 inc Capri, LTD, Custom, XL & wgn	\$7.95
9360	FORD COURIER 72-77 covers all models imported	\$9.95
0451	FORD PICKUP 69-79 covers all models	\$9.95
8204	FORD VANS 66-68 covers all models	\$7.95
0453	FORD VANS 69-79 covers all 6 & V8 models	\$9.95
9436	GRANADA FORD 75-77 covers all models	\$7.95
8677	GREmlin & HORNET 71-77 covers all 6 & V8 models	\$9.95
0844	HONDA 360, 600, 700, all models	\$9.95
0885	HONDA ACCORD 76-77	\$9.95
8634	HONDA CIVIC, CIVIC CRUX 73-77 covers all models	\$9.95
8206	INTERNATIONAL SCOUT 67-73 800, 4, 8 models	\$7.95
8565	INTERNATIONAL 62-75 truck & machine all models	\$7.95
1207	JAGUAR XK120, 140, 150 48-61 also Mk 7 & 8	\$9.95
1206	JAGUAR 55-69 sedan-mod 2, 4, 3, 6, 240, 340	\$9.95
1043	JAGUAR X-TYPE 61-72 covers all 6-cylinder models	\$9.95
9612	JAGUAR X-TYPE 71-72 74 covers all models	\$9.95
9399	JAGUAR XJ6 68-78 covers all models	\$9.95
9617	JAGUAR XJ6 72-77 for all models inc Daimler	\$9.95
9749	JEEP 50-55 for 4 & 6 cyl models	\$15.95
8207	JEEP 56-79 for all Cherokee, Comanche & Wagoneer models	\$7.95
9805	JEEP WAGONER 1980-81 for 200 d/c eng	\$15.95
9805	JEEP UNIVERSAL C-1, C-3 reprint factory manual	\$15.95
0509	JEEP CJ-5, CJ-6, CJ-7 55-79	\$7.95
8856	JEEP FC150, 170 covers all front cab models	\$15.95
8739	JENSEN HEALEY reprint of factory manual	\$19.95
7119	LANDROVER 1, 2 48-61 for all models	\$9.95
1254	LANDROVER 59-76 covers 2, 2A, 3 L&S & diesel models	\$9.95
1148	LINCOLN 55-70 covers all models	\$9.95
6773	LINCOLN 71-77 all models inc Versailles	\$9.95
0481	MAVERICK 64-71 6 cyl 120-200 250 cu in eng	\$7.95
8211	MAZDA 626 72-77 covers all models	\$7.95
1550	MAZDA GLC 77-78 covers all models	\$7.95
0370	MAZDA RX2 70-73 covers sedan & coupe models	\$9.95
0371	MAZDA RX3 70-73 covers all models	\$9.95
0434	MAZDA 71-78 inc Delia, RX4 and Cosmo models	\$7.95
0880	MAZDA PICKUP 72-75 1600 & rotary eng models	\$7.95
0563	MAZDA 616 72-78 covers all models	\$9.95
0573	MAZDA 1500, 1800 67-74 covers all models	\$9.95
1009	MERCEDES BENZ 190 59-68 4 & 6 C & 200 models	\$9.95
0781	MERCEDES BENZ 190SL reprint of owner's manual	\$7.95
1746	MERCEDES BENZ 220 59-65 covers all models	\$9.95
9483	MERCEDES BENZ 220 68-72 models except Diesel	\$9.95
1747	MERCEDES BENZ 230 63-68 inc 230S & SL	\$9.95
1748	MERCEDES BENZ 250 65-68 covers all models	\$9.95
9494	MERCEDES BENZ 250 69-72 covers all models	\$9.95
9485	MERCEDES BENZ 280 57-72 covers all models	\$9.95
0416	MERCEDES BENZ 68-73 inc 280, 300 & 450 V8 models	\$9.95
8439	MERCEDES BENZ 74-79 covers all models inc Diesels	\$9.95
1149	MERCEUR 55-70 covers all models	\$9.95
9773	MERCEUR 71-77 for all models inc Cougar	\$9.95
1105	MG TA, TB, TC, TD, TF 36-55	\$9.95
1098	MG MIDGET 58-78 covers all models	\$9.95
1106	MG MGB 55-68 covers all models inc twin cam	\$9.95
1720	MGB, MGBGT 69-79 all roadster & coupe models	\$9.95
8396	MGB reprint of factory manual	\$19.95
0917	MINI 59-75 covers all models inc Mini Cooper	\$9.95
9436	MONARCH, MERCURY 75-77 for all models	\$7.95
0050	MONZA, CHEVROLET 77-79 factory manual give car year	\$12.95
1109	MORGAN 36-73 covers all 4-cyl models	\$9.95

8395	MUSTANG 65-73 covers all 6-cylinder models	\$9.95
0479	MUSTANG 66-73 covers all models	\$9.95
8177	MUSTANG 74-76 covers all 4, V6 & V8 models	\$9.95
8282	NADA 69-77 covers all 6 & V8 models	\$7.95
7107	OLDS CUTLASS 70-77 covers all inc 442 models	\$7.95
0578	OLDSMOBILE covers all models—55-74	\$9.95
0008	OLDSMOBILE 75-79 factory manual give year	\$16.95
1724	OPEL KADETT 62-73 1000, 1100, 2200 models	\$9.95
1752	OPEL KADETT 64-68 2400, 1700, 1900 models	\$9.95
0858	OPEL 1900 MANTRA 70-74 covers all coupe models	\$9.95
8273	OPEL 75-77 covers all models inc Lotus	\$9.95
9589	OPEL GT 68-73 covers all 1900 models	\$9.95
9872	PEUGEOT 304 covers all models—70-73	\$9.95
1545	PEUGEOT 404 60-75 covers all models	\$9.95
0876	PEUGEOT 504 68-74 includes Diesel models	\$9.95
7124	PEUGEOT 504 68-76 for all gasoline models	\$7.95
8242	PINTO 70-73 covers all models	\$9.95
0883	PINTO 74-79 covers all models inc Barchet	\$7.95
1145	PLYMOUTH 55-71 all inc Belvedere, Fury, Satellite	\$9.95
0874	PLYMOUTH 72-76 Fury, Fury Gran, Suburban models	\$7.95
1640	PLYMOUTH HORIZON 78-79 covers all models	\$9.95
0030	PONTIAC 69-75 factory manual all models give year	\$17.95
0489	PONTIAC TEMPEST 65-73 all models inc GTO Le Mans	\$7.95
1630	PORSCHE 356 57-65 covers A, B & C models	\$9.95
1591	PORSCHE 911 64-73 covers all models	\$9.95
8172	PORSCHE 911 74-77 includes N.S. Targa Carrera	\$9.95
1590	PORSCHE 912 65-68 with 1582cc engine	\$9.95
9834	PORSCHE 914 70-76 all models inc 914-6	\$9.95
0993	PORSCHE 924 76-78	\$9.95
8208	RAMCHARGER, TRAILDUSTER 74-75 all models	\$7.95
0372	RENAULT 5 72-78 for all models inc Le Car	\$9.95
1224	RENAULT 8 10 62-72 covers all models inc 1100	\$9.95
9479	RENAULT 12 69-79 covers all models inc auto trans	\$9.95
0645	RENAULT 15 71-77 78 all models inc TL, TS	\$9.95
1594	RENAULT 16 65-78 covers all models	\$9.95
0395	ROADRUNNER & SATURN 68-73 all models	\$7.95
1121	ROVER 2000 63-75 for all models inc 2200	\$9.95
9493	SAAB 96, 96 66-75 covers all 94 models	\$9.95
0750	SAAB 99 69-76 covers all models inc fuel injection	\$9.95
8440	SAAB 67-79 covers all models inc Sedan	\$9.95
1098	SPRINT 58-71 covers all models 1, 2, 3 & 4 models	\$9.95
8058	SUBARU 77-77 covers all models	\$9.95
0853	SUNBEAM ALPINE 55-65 Mk 1, 2, 3 & 4 Repet	\$9.95
0845	SUNBEAM TIGER reprint of factory shop manual	\$19.95
0489	TEMPER, GTO, LE MANE 68-73 all models	\$7.95
9728	THUNDERBOLT 71-77 covers all models	\$9.95
8189	TORINO 68-74 all models inc Elite, Ranchero	\$7.95
0910	TOYOTA CELICA 70-77 covers all models imported	\$9.95
0829	TOYOTA CELICA 78-79	\$9.95
7127	TOYOTA COROLLA 68-74 for all models	\$9.95
9812	TOYOTA COROLLA 75-77 all including 5-speed	\$9.95
1738	TOYOTA CORONA 65-68 covers 4-cyl 1500 models	\$9.95
0926	TOYOTA CORONA 69-73 for all 4-cyl models inc Mk II	\$9.95
0985	TOYOTA CORONA 74-77 covers all 4-cyl models	\$9.95
7527	TOYOTA CORONA 68-76 covers all 4-cyl models	\$9.95
0754	TOYOTA CORONA Mk 2 72-74 for all 6-cyl models	\$9.95
0647	TOYOTA LULUX 68-77 covers all pickup models	\$9.95
8524	TOYOTA LAND CRUISER 66-77 covers all models	\$9.95
0687	TRIUMPH STAG 70-74	\$9.95
1200	TRIUMPH SPITFIRE 60-78 covers all models	\$9.95
1016	TRIUMPH GT6 68-74 for all models plus Vitesse	\$9.95
1225	TRIUMPH TR2, TR3, 52-62 covers all models	\$9.95
1231	TRIUMPH TR4 61-67 covers all models	\$9.95
1015	TRIUMPH TR5, TR6, 67-76 all models inc TR250	\$9.95
8693	TRIUMPH TR7 75-77	\$9.95
8192	VALIANT 68-76 all models inc Scamp, Signette	\$7.95
0567	VEGA 72-73 all 140 CID & GT 140 CID models	\$7.95
0484	VEGA 74-77 covers all models	\$7.95
9464	VOLARE, PLYMOUTH 76-78 for all models	\$7.95
1217	VOLKSWAGEN BEETLE 54-67 for all models inc M.G.	\$9.95
0140	VOLKSWAGEN BEETLE 68-77 covers all models inc M.G.	\$9.95
6010	VOLKSWAGEN RABBIT, SCIROCCO 74-79 all models inc Diesel	\$16.95
1547	VOLKSWAGEN BUS 54-67 all camper, van, transporter models	\$9.95
7130	VOLKSWAGEN BUS 68-78 all camper, van, transporter models	\$9.95
9582	VOLKSWAGEN TYPE 3 62-73 for squareback, fastback	\$9.95
9639	VOLKSWAGEN 411 68-72 covers all E, L, LE models	\$9.95
9778	VOLKSWAGEN 412 71-74 covers all models	\$9.95
8748	VOLKSWAGEN DASH 74-78 covers all models	\$14.95
9444	VOLVO P1800 60-73 all models inc C & ES	\$9.95
1722	VOLVO 122 61-70 for all models inc GT	\$9.95
1754	VOLVO 142, 144, 145 66-74 for all models inc 5 & 6	\$9.95
9558	VOLVO 164 68-74 for all models inc fuel injection	\$9.95
3729	VOLVO 242, 244, 245 75-78 for all inc fuel inj	\$9.95
8311	VOLVO 262, 264, 265 75-78 all models inc fuel injection	\$9.95

GENERAL INTEREST BOOKS

1264	CHILTON AUTO REPAIR 73-80 for all American cars	\$16.95
0743	CHILTON AUTO REPAIR 72-79 for all American cars	\$14.95
1775	CHILTON AUTO REPAIR 68-75 Reg. \$12.95, Special	\$6.95
1263	CHILTON AUTO REPAIR 64-63 for all American cars	\$17.95
8561	CHILTON TRUCK REPAIR MAN 61-71 for all 1-2-3 ton models	\$9.95
9700	CHILTON IMPORT CAR MANUAL 73-79 for ALL pop imports	\$18.95
9839	MOTOR'S AUTO REPAIR 74-79 for all U.S. built cars	\$16.95
0445	CAR ECONOMY TUNING GUIDE getting most from the lease	\$2.95
7125	AUTO AIR CONDITIONING... service & repair all	\$6.95
8726	TRANSISTOR IGNITION SYSTEMS covers them all	\$5.95
1067	MORE MILES PER DOLLAR GUIDE How to do it right	\$5.95
1509	INTRODUCTION TO TUNING what it is & how to do it	\$2.95
9622	HOW TO TUNE YOUR CAR good for all cars	\$4.95
8859	GM DIAGNOSIS & REPAIR MANUAL 70-80 for all GM cars	\$9.95
1212	BASIC AUTO REPAIR MANUAL a must for any car	\$9.95
1707	BASIC BODYWORK & PAINTING	\$3.95
1711	BASIC CARBURETORS & FUEL SYSTEMS	\$3.95
1706	BASIC CHASSIS, SUSPENSIONS, BRAKES	\$3.95
0791	BASIC ENGINE ROTATING	\$3.95
1708	BASIC IGNITION & ELECTRICAL SYSTEMS	\$3.95
0480	BASIC AUTO TROUBLESHOOTING for all cars	\$3.95
8359	BRAKE SERVICE GUIDE for repairing all types & makes	\$5.95
3759	ELECTRONIC FUEL INJ MAN 70-77 for all imported cars	\$9.95
0889	FUEL INJECTION MANUAL covers all systems through 1972	\$14.95
9411	HOLLEY carbs. at 2 & 4 cyl. line & rebuild	\$5.95
9282	ROCHESTER carbs. all inc 4M Quadrajet	\$9.95
9666	SOLEX CARBURETORS at 1 & 2 barrel down draft	\$2.95
6354	SU CARBURETORS line & rebuild all to 1976	\$6.50
9423	STROMBERG CO CARBS tune/rebuild all to 1976	\$6.50
0734	WEBER DCOE carburetor manual	\$4.95
1153	WEBER CARBURETORS theory & design	\$3.95
9803	WEBER CARBURETORS tuning & rebuilding all	\$3.95
0827	AUTOMOTIVE REFINISHING best paint book yet	\$5.95
8425	MINOR AUTO BODY REPAIR step by step how to	\$5.95
5104	AUTOBODY REPAIRING & REPAINTING the best	\$5.95
5106	GLASS FIBER AUTO BODY construction & repair	\$3.95
1071	CREATIVE CUSTOMIZING how to do it - the pop	\$6.95
0341	PRACTICAL ENGINE SWAPPING how to do it right	\$5.95
8549	MORE DIESEL CARS describes all models now sold	\$5.95
0682	DIESEL, GAS & GASOLINE 73-80 Dodge, Chrysler, Jeep	\$6.95
0687	GLYNH DIESEL/GAS 71 MAN 70-73 Dodge, Chrysler, Jeep	\$6.95
8432	DIESEL ENGINES, HOW TO REPAIR, complete transfer edition	\$5.95

KEEP MAGAZINES, CATALOGS, MANUALS, JOURNALS NEAT and ORGANIZED in HOME, OFFICE, WORKSHOP!

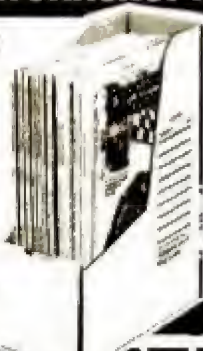


ALL POPULAR SIZES AVAILABLE

From digest size to newspaper size! Popular letter and magazine size (9" X 11 1/2", 3 3/4" box width) — 8 for \$12.95, 25 for \$28.97 postpaid. Sturdy heavy-duty fiberboard will last for years! Charge it! Mail coupon below.

END CLUTTER! FIND IT FAST ... THE FIRST TIME WITH HANDY, HUSKY, HEAVY DUTY FIBERBOARD SHELF FILES

Eliminate the mess of loose magazines, newspapers, catalogs, etc. at home, in the office, in garage or workshop. Find what you want when you want it by using these handy shelf or desk top files. Ends personal paper pollution problems once and for all! Adhesive ID labels included.



Professional Aids Co., Suite 220
3685 Commercial Ave., Northbrook, IL 60062

Please rush postpaid Fiberboard Desk and Shelf Files as checked below:

How Many	Qty.	Size	Price	Total Price
	8	Letter Size	\$12.95	
	25	Letter Size	28.97	

☐ Charge it to ☐ Visa ☐ Mastercharge TOTAL: _____

Acct. No. _____ Exp. Date _____

Name _____

Address _____

City/State/Zip _____

Illinois Residents add 5% Sales Tax, please. Other sizes from digest to newspaper available.

☐ Check for Free Catalog

☐ I enclose \$ _____ full payment. Ship postpaid.

NO INVESTMENT! INSTANT INCOME!

Run your own profitable "shoe store" business from home in spare or full time. We give you — FREE — complete Starting Kit that makes you \$217.00 EXTRA each month for just 2 easy orders a day. You feature 350 fast-selling dress, sport, work shoe styles for men and women. Air-cushioned insoles, and 75 years of shoemaking craftsmanship! Sizes 4-16 — widths AA-EEEE. Draw on 500,000 pair stock. Earn prizes, bonuses, shoes for yourself. Rush postcard for your FREE Starting Kit today ... Now!



MASON SHOE MFG. CO.,
Dept. H-426
Chippewa Falls, WI 54729

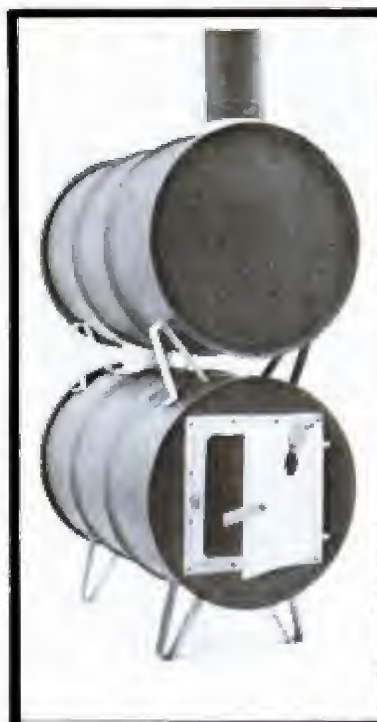


TUNE YOUR GUITAR Like A Professional

This new invention is ideal for every guitarist — beginner or professional. Six precision tuned reeds make exact tuning a snap. Just clamp onto your guitar, then adjust the strings. When the proper pitch is reached, the corresponding reed vibrates. Just as easy as that! Ideal for bands or combos. Tunes all instruments to exactly same pitch.
\$8.95 plus \$1
shipping and handling
Money back guarantee.

ED SALE Studio 834-P, Grand Island, Fla. 32735

The Workshop Heater.



SAFE CONTROLLED EFFICIENT HEAT

This kit converts a 55 gallon drum (not supplied) into a high capacity woodburner. Internal draft channel, spark proof, air light design, allows safe, controlled, efficient heat while limiting metal temperature of drums to prevent burn through. Use draft control for heating large or small areas. Easily heat your entire home. Burns over 24 hours. Heavy steel kit bolts together quick and easy. Top drum squeezes 60% more BTU's from heat normally lost up chimney. Before you spend \$500 or \$600 on a wood heater, try the Sotz Heater Kit for under \$60. Within 10 years, if the kit cracks, warps or burns up, or if within 1 year the drum shows any sign of burning up, your money back.

Thousands are used by the U.S. Army, U.S. Forestry Service, Federal, State and local government agencies.

Learn to heat water at lowest cost, easiest, safest and automatically. Season/dry wood in days instead of months.

Bottom Kit: Send \$34.95 (delivered U.P.S.)
Top Kit: Send \$20.95 (delivered U.P.S.)

Send for the Sotz News.

Sotz Corp. • 13610 Station Rd. • Columbia Sta., Ohio 44028

COVERALLS

2 FOR
\$9.95



Great for work or those around the house jobs, made from a material called Tyvek which has been used in industry

for years. Tyvek is a tough reusable clothing material that can cut those dirty job apparel cost. Completely durable, water resistant, chemical resistant and comfortable. Can be laundered or drycleaned. Satisfaction guaranteed. Send check or money order for 99¢ plus 50¢ shipping to **BAY COUNTRY DISTRIBUTORS INC.** P.O. Box 1568 Easton MD. 21601

Name _____
Address _____
Size: M _____ L _____ XL _____ Color: White _____ Blue _____



PLANS AND INSTRUCTIONS FOR	
Go Kart	\$2.50
Mini Bike	\$2.00
Mini car	\$3.00
12" Sail Boat	\$4.00
Front Tractor (Go Kart with Gearless Differential)	\$10.00
Mini Jeep	\$3.00
Pedal Boat	\$4.00
4 H.P. Tractor	\$10.00
Soap Box	\$3.00

Mini Vehicles Plan
Cherry, N.Y. 12921

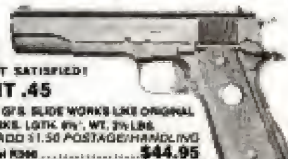
COUNTERFEIT GUNS

AUTHENTIC! FULL SIZE MACHINED METAL MODELS
Museum quality precision machined metal classics weigh, look and feel like real guns. Will fool experts. Perfectly legal! — CANNOT BE FIRED. Blued and stainless steel originals. Decorate your den, office, recreation. Send for FREE FULL COLOR CATALOG. Made of over 30 blued, hand-finished parts — DELIVERED FULLY ASSEMBLED.

SAME SIZE AND WEIGHT AS THE ORIGINALS!

GOVERNMENT .45

STANDARD SIDEARM OF G.I.S. SLIDE WORKS LIKE ORIGINAL WITH SAFETY THAT WORKS. LOOK, FEEL, WEIGH LIKE DISASSEMBLE. ADD \$1.50 POSTAGE/HANDLING LIKE ORIGINAL. Model R300 **\$44.95**



REPLICA MODELS, INC., P.O. BOX 1001

DEPT. PM-020 800 SLATERS LANE, ALEXANDRIA, VA 22313

Send ☐ R300 ☐ Send FREE COLOR CATALOG

Charge to: ☐ SACS ☐ MasterCard ☐ Am. Express ☐ Discover's Club

NAME _____
ADDRESS _____
CITY/STATE/ZIP _____

MONEY BACK IF NOT SATISFIED



THE TROUBLE-FREE WIRE DISPENSER

By WEDCO Manufacturing Inc., Dept. P-175 50
Spartan P.O. Box D Jackson WY 83001 (307) 253-2708

- Developed by an Electrician for Electricians
- Saves Time — Wastes Wire
- Speeds Handling of Several Cords
- Moves Like a Hand Tool
- Capacity is 5 — 2000' x 10 AWG Reels
- Weights Just 72 Pounds

WRITE FOR BROCHURE AND PRICES



Rockwell Speed-Bloc Sander — Palm grip design for one hand use. Thumb control switch, off-set pad for 4 way flush sanding. 12,000 OPM. 100% Ball Bearing, 5/64" Orbit. 115 V. Direct Motor to pad design. Pad size 4 1/2" x 4 1/4". Add \$2.00 for shipping. Reg. \$69.99
4480(330)-R7 \$53.98

SILVO (BRAND NAME) TOOL CATALOG

THOUSANDS OF EXCITING TOOL VALUES: Stanley, Wren, Speedy-Sprayers, Milwaukee, Rockwell, Dremel, Skill, Nicholson, Disston, Millers Falls, Helios, Wellsaw, Plumb, Kennedy, Huot, Ridgid, Crescent, Vise-Grip, Audel Books, Unimat, Wiss, Channel-lock, General, Pony Clamps and many Nationally Advertised brands of tools and supplies. We ship Coast to Coast at prices hard to beat. Send \$1.00 for our big SILVO TOOL CATALOG today.

SILVO HARDWARE CO.

2205 Richmond St., Dept. PMO-2 Phila., Pa 19125



Your Monterey Domes geodesic shell package is delivered, ready to assemble using jigsaw tools. No skills necessary. Monterey Domes meets all building codes and V.I.T.A. standards. Free on construction plans and up to 50% off energy costs! Priced from \$3895. Send \$24.00 now for our 80 page catalog and planning kit.

Please rush me your 80 page full color catalog and planning kit. I am enclosing \$4.00. Also send me the Monterey Domes Assembly Manual for an additional \$5.00.

NAME _____
ADDRESS _____

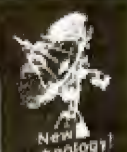
CITY, STATE, ZIP _____

Mail to: Monterey Domes, Dept. 150
P.O. Box 5521, Riverside, CA 92517

SATELLITE TV GET 50 CHANNELS!

It's all free! No matter where you live, receive movies, sports, day television, sports, news, audio, the world's best programming! Crystal clear reception! For complete information, sources and design information, send \$7.95.

SPACECOAST RESEARCH
Dept. E, P.O. Box 442, Altamonte Springs, FL 32714



OFFER EXPIRES MAY 31

Hardened Steel, 1/4" thick, drilling, milling, turning any metal or wood. Cutting edges from 1/4" to 1", all shanks 1/4". Brand new in air-tight G.I. packs.

32-Tool Set, G.I. cost \$275 now... \$22.00
14-Tool Set, G.I. cost \$114 now... \$16.00
Save Even More, Both Sets now... \$33.00
Two \$33 Sets (limited time) \$52.00
100% Guaranteed. Add \$2.50 for shipping.
Texas orders add 5% tax. Export orders add \$3.
U.S. SURPLUS CENTER, Dept. 303
715 Camden, San Antonio, Texas 78216

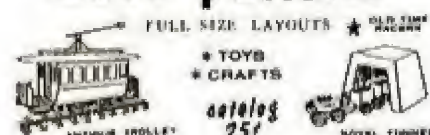
DUNE-BUG

Complete plans & specs on how to build or buy - also, prices on parts, kits, engines, & raw material.



Send \$2 for DUNE-BUG pkg to:
K & P Mfg.
330 E. Irwindale, Azusa, CA 91702

wood patterns



CRISS-CROSS BOX 384 F WAYNE, N.J. 07470

PUMPS

BUY DIRECT AND SAVE
Drain - Irrigate - Circulate - Spray

Heavy duty ball bearing pump. All metal, rust-proof Type AB. Stainless shaft. Use 1/4" HP or larger. 1 HP 1,200 GPH 60" high or 3,000 GPH 25" well. 5,200 GPH max. 1 1/4" in. 1" out. Belt or direct drive. \$19.95
Type F won't rust or clog. Bronze bearing. To 2,400 GPH. 1" in. 3/4" out. \$13.95
ADD \$2 price & handling. Money back guarantee.
LABAWCO, 80 Hwy 206, Belle Mead, N.J. 08502

10 YEAR
Guarantee
\$450



GREAT all purpose knife for the outdoorsman. Offers you the quality of CUSTOM made models selling for much more! Hand polished imported surgical steel blade has SAFETY LOCK to prevent accidental closure. Expensive Facer wood handle. SOLID BRASS bolsters and liner. Popular 4" size (7 1/2" open). IF BROKEN IN 10 YEARS WE WILL REPLACE AT NO CHARGE! Use 30 days, money back if not pleased. Send \$4.50 plus 48¢ postage & handling TODAY. Midwest Knife Co., Dept. W-2605 9043 S. Western Ave., Chicago, Ill. 60620. Mail orders only.

Fabulous Folbotting NOW

Avoid the risks and discomfort of floppy canoes, skimpy kayaks, wobbly inflatable rafts! NOW, you GLIDE securely in perfected Folbot, completely relaxed in EXCLUSIVE SWIMBACK COMFORT. America's foremost small craft in various styles and colors from 1 to 4 seaters. GLIDE smoother, faster with EASIER lightweight double blades, efficient yacht smart sails, small motors. Perfect for nature study, scouting, float cruising, supreme in white water, surf. Marsh and Sea. Most INEXPENSIVE in EASY PREFAB kits or ready FACTORY BUILT, also have smart FOLDING types to fit inside trunk or aircraft.

FOLBOT

Super Craft at
BIG SAVINGS
Easy PREFAB
Kits from \$134
or carport
FACTORY
BUILT
from \$249
FOLDING
from \$439
ideal
Sail Rig
\$229

©



Smart
Economic
BASIC Kits
12 foot
Single \$34
14 foot
Double \$44
Big Sailer
14 foot \$57

FREE

Action Color Catalog
With Facts & Figures

For rush inc. \$1
First Class Postage

Mail coupon or address

to: FOLBOT CORP. PM260
Charleston, S. C. 29403

Print
Name _____
Address _____
City _____ State _____ Zip Code _____

"PAY" YOURSELF \$1000+ to BUILD THIS NEW 4-WHEEL HAULER

- 16 or 11 H.P. Briggs & Stratton electric start engine • automatic torque converter transmissions • 500 lbs. payload plus two passengers • dump box 44 1/2" x 40" x 11" • steering wheel, foot pedal controls • forward and reverse gear • rear dual hydraulic disc brakes

Tough Mark Series Haulers lug 500 lbs. of cargo plus you and a passenger almost anywhere. 16 H.P. opposed Twin-Cylinder or 11 H.P. Synchro-Balanced Briggs & Stratton engine, automatic torque converters (no manual shifting), alternator and electric start. Steering wheel, foot pedal accelerator and brake (rear dual hydraulic disc), forward and reverse gear let you maneuver easily with speeds up to 25 MPH. Dump bed 44 1/2" x 40" x 11" extends to over 4' with tail gate opened. Many accessories. Build it yourself and SAVE \$1000+. Engine mounts to welded & painted frame. Tires mounted on rims. You bolt parts together and pocket assembly costs. Only simple tools needed. Thousands from eight to 80 have built a Carl Heald Kit.

For more information call 616/849-3400 or write for FREE brochure today:

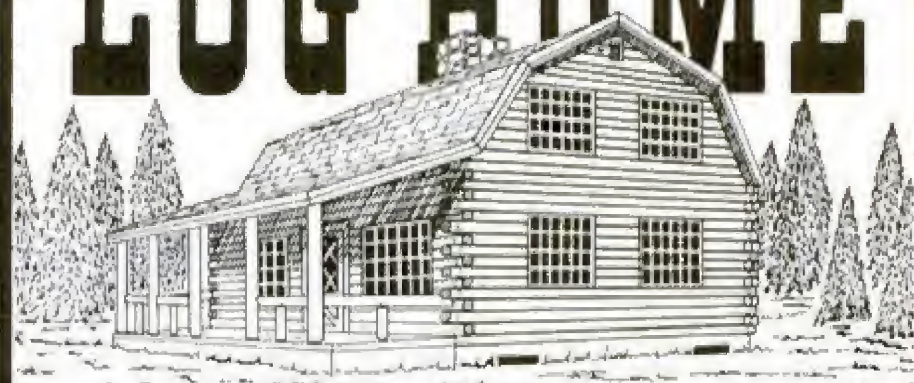


Heald Hauler
Mark 4 Model HH-416
shown with optional
headlights and knob ties.

Also
3-wheel models
and with steel cab

Carl Heald, Inc. Dept. PM-20
P.O. Box 1148, Benton Harbor, MI 49022

Select Your LOG HOME



AMERICA'S BEST INSULATED HOMES! Pre-cut "EXTRA INSULATED" log home kits in select, treated and hand peeled Northern White Cedar or Lodge Pole Pine priced from \$3900. Use your custom plan or select one of ours. We manufacture kits for any log structure. Send for Plan Book \$3.50, or a Dealership Information Package \$6.00

Wilderness Log Homes

Route 2 • PMC20 Plymouth, Wis. 53073

Please Send: ☐ Plan Book \$3.50 ☐ Dealership Information Pack w/Plan Book \$6.00

Name _____
Street _____
City _____ State _____
Zip _____ Phone () _____

NEW PORTABLE POWER SEWING MACHINE WITH "WALKING FOOT"

FOR UPHOLSTERING AND HEAVY SEWING
READY TO USE

HALF THE PRICE OF OTHER MACHINES THAT DO THE
SAME WORK

SPECIAL INTRODUCTORY PRICE: ONLY \$450.00 (as shown)

For use at home or shop
to make or repair:

- Auto Seat Covers
- Boat Seats
- Van Interiors
- Boat Sails
- Draperies
- Light Leather
- Tarps
- Trampolines
- Floor Mats
- Heavy Clothing
- Furniture Upholstery

Forward and Reverse sewing
Total Weight—36 lbs.

Available at your Local Dealer
or, Order Direct.

THOMPSON
MINI-WALKING
FOOT
MODEL
PW103-A



Dealers Contact:

HUEY SEWING
MACHINE CO.
P.O. BOX 75212
OKLAHOMA CITY,
OK. 73147

PHONE # 405/943-5793

DIRECT ORDERS

To: Datho Mfg., Inc.
P.O. Box 12110
Lubbock, Tx. 79452
(806) 745-6031

- ☐ Cashiers Check or Money Order
- ☐ Personal Check (allow 20 days to clear)
- ☐ Texas Residents add \$22.50 sales tax

Name _____ Address _____
City _____ State _____ Zip _____

Monster Maul

WOOD SPLITTING CAN BE EASY...WITH THE SOTZ MONSTER MAUL

Total weight: 15 lbs. (Head - 12 lbs.)



- Splits most logs in one lick—won't stick.
- Rugged all-steel tool guaranteed 10 years.
- Split 'em where they fall.
- No struggling or lifting heavy logs up to mechanical splitters.
- Ends broken handles, stuck axes, flying wedges.
- No stooping over, stands upright on flat end.
- All around fastest, easiest hand splitter made or your money back!

\$22.98

(delivered U.P.S.) included in price

Send for the Sotz News.

Sotz Corp. 13610 Station Rd. Columbia Sta., Ohio 44028

Low-Cost Energy Saver!



Build this beautiful 3 br., 1140 sq. ft. home for \$6500, complete and cut your heating & cooling bills 50%. Tanyon's new do-it-yourself Home Kit "80" includes bldg. plans, material list & special instructions. Home Kit shows how easy it is to build this home. Think of the money you'll save with this no-mortgage home! Want to price several low-cost energy saving homes before choosing one? Then our Home Price Planning Book is for you. It contains 49 home designs, floor plans & material lists.

Money Back Guarantee.

Order both today and never make a mortgage payment again! Send your Name, Address, City, State & Zip plus: \$58.00 for Home Kit "80", \$510.00 for Home Price, \$515.00 for both, saving \$3.00! Or send \$1.00 for information pkg. Mail Today To: TANYON PRESS, Dept. PM2, 2427 W. 26th St., Erie, Penna. 16508.

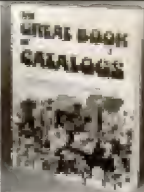
SLASH ENERGY COSTS!

Very Controversial Survival Publications (over two dozen) on Electric, Gas and Water meters, Phones, T.V., Guns and Ammo and Other Vital Topics, including Monthly Newsletter. By John J. Williams, M.S.E.E., as seen on CBS "60 Minutes" (3-5-78). ONLY YOU CAN ASSURE YOUR OWN SURVIVAL!! Send \$1 (apply to first purchase) for our Super Brochure to:

CONSUMERTRONICS CO.
P.O. BOX 475 ALAMDORRO, NM 88138

How (and where) to find Almost Anything—By Mail

New 176 page directory of over 2000 mail order catalogs. Absolute money back guarantee (order within 15 days to get free newsletter subscription). Send \$9.95 or for details write to:
Pinkerton Marketing Inc.
1355 Oak Terrace
Lake Bluff, IL 60044



GREAT SAUSAGE RECIPES AND MEAT CURING

227 Page illustrated book explains sausage making plus home curing and smoking of meat, fowl and fish. Over 100 Recipes. Free equipment and supply catalog has more information. For yours, send to:

The SAUSAGE MAKER 1067 Grant St.
Dept. F12 Buffalo, N.Y. 14207



RE-LITE

2 bulb fixture duplicated the charm and increases the light output of a double mantle gaslight. Kit includes on-at-dusk, off-at-dawn photo control, fixture, bulbs, detailed instructions. Your energy savings will pay for this kit in less than 6 months. 115 volt kit \$29.95 postpaid, or safe 12 volt kit including UL approved transformer, \$39.95. Dealers and installers inquiries invited.

Yardlighting Systems, Inc.
1678 Hewitt
St. Paul, MN 55104



Build this 1/4 Size 1901 Ford as a Father & Son Project for \$100.00. For Blueprints and construction information send \$7.50 to:

Devore Enterprises
P.O. Box 22314 Indianapolis, IN 46222



GO... HUNTING
with a White's
electronic mineral/metal detector
Locate gold, silver, coins, rings... from \$59.95
U.S. Patented • Call Toll Free for nearest Dealer Up...
(800-547-6911)
ELECTRONICS...Free Literature...DEPT. PO
1011 Pleasant Valley Rd., Sweet Home, OR 97386

FOR • KITCHEN
• WORKSHOP • BOAT
• TRAILER • CAMP
• GARAGE MAGNETIC



Solve your HANG-UPS

Magnabar Mark XII. Lifetime guarantee, convenient, practical, versatile, trouble-free. Fashioned in 12" hardwood, singly boxed. Mounts quickly on any surface. Excellent gift. Model SS-12: **\$5.95 p.p.** each. Send check or M.O. Complete Catalog on request.



Phelon Magnagrip Company, Inc.
Dept. F-503 East Longmeadow, Mass. 01028

RICKA DUO-WHEEL CONVERSION KIT AND FIBERGLASS FENDERS



New wide tire adapters & fenders to fit most mini-, 1/2-, 3/4- & 1-ton trucks. Simple bolt on installation. Increases traction, load capacity & life.

The ultimate in safety protection for your family.

RICKA MFG. DEPT. RPM-2

Piquette Lakes, MN 56472

Split
EASIER & FASTER!

THE BOSS LOG SPLITTER!

Only \$49.95 plus \$3 p. & h. for adaptable cone, or \$99.95 plus \$5 ready-to-attach to hub of car or light truck (specify vehicle). Pa. — send 6% sales tax. Free info—send stamped self addressed envelope. Good Products, Route 3 Box 88-A PM, Kutztown, Pa. 19530



1184 SQ. FT. FLOOR SPACE: \$3,200

Purchase the material locally, and build this beautiful "A" FRAME CABIN. Complete plans, illustrated instruction manual and material list: ALL FOR \$5.00 on a MONEYBACK GUARANTEE. Send \$5.00 for plan #412 to:

DEPENDABLE PRODUCTS CO.
P.O. box 1645, Vista, Calif. 92083.

MAKE MONEY! REPAIR HYDRAULIC JACKS



Earn while you learn at home. Millions of jacks in gas and auto service stations, trucking firms, body shops, riggers, factories and farms need servicing... most of which you can learn to repair. We show you HOW. Start spare time in your basement or garage. Big opportunity for mechanics, A.C. repairmen and home owners.

Folder No. PM-2, and free home offer.
Hydraulic Jack Repair Manual Co., Inc.
P.O. Box 8023 • Staten Island, N.Y. 10314

MAKE TOP MONEY IN STAINED GLASS



Learn at home in your spare time. Program in which you can completely illustrated lessons, all professional tools, interesting projects and more. Our self study program gives you everything needed to start your own money making business. You can earn big money making stained glass lamp shades, windows, jewelry — sun catchers and more. **\$12.95** (incl. P&H) Region Carvers Ltd. • Publication Dept. PMG/20 33 E. Main St., Round Lake Park, Ill. 60073

BUILD YOUR OWN • MOTORHOME



• 5th WHEEL
• CAMPER
• TRAILER
• COVER
• VAN



KITS • PLANS • FULL SIZE PATTERNS

GLEN-L component kits, plans, and full size patterns make it easy AND YOU SAVE \$\$\$! Factory-like methods adapted for amateurs assure professional results you'll be proud of. Pictorial instructions cover frame construction, undercarriages, cabinetry, framing, electrical, plumbing, aluminum skin, and more! Building is fun! No special skills or tools required. Dozens of models PLUS equipment, parts, aluminum skin all available at DISCOUNT PRICES! Send \$1 today for illustrated catalog showing RV PLANS, KITS, & EQUIPMENT.

GLEN-L RV's

8152P Rosecrans Bellflower CA 90706

GLEN-L RV's

8152P Rosecrans Bellflower CA 90706

Enclosed is \$1.00. Please rush RV KITS & PLANS catalog.

Van Conversion Plans (all models) only \$5.00

Name

Address

City

State

Zip Code

BUILD YOUR OWN BOAT

Join the thousands who build each year AND SAVE \$\$\$! GLEN-L's proven methods are especially intended for amateurs. Step-by-step pictorial and written instructions with material listings assure PROFESSIONAL RESULTS! HUGE 128 page catalog describes over 150 designs, 8' to 49'. Sailboats, powerboats, boat trailers, boating books, AND MORE! Order catalog now and also receive FREE "BOATBUILDING SUPPLIES" brochure.

KITS • PLANS • PATTERNS



GLEN-L

8152 Rosecrans Dept T Bellflower CA 90706

GLEN-L MARINE DESIGNS

8152 Rosecrans Dept T Bellflower CA 90706

Rush _____ GLEN-L catalogs @ \$1.00 ppd. (52 CANADA)

_____ "BOATBUILDING WITH PLYWOOD".....\$28.95 ppd.

_____ "INBOARD MOTOR INSTALLATIONS".....\$26.95 ppd.

_____ "HOW TO FIBERGLASS BOATS".....\$25.95 ppd.

_____ "HOW TO BUILD BOAT TRAILERS".....\$24.95 ppd.

_____ "RIGGING SMALL SAILBOATS".....\$24.95 ppd.

NAME

STREET

CITY

STATE

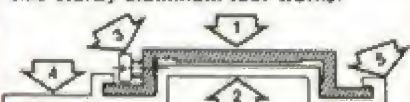
ZIP

CUT STRAIGHT WITH 'STRATE-CUT'



A MUST FOR ALL POWER TOOL USERS

Use "STRATE-CUT" Cutting Guide with any portable circular saw, jig saw or router. Extends to 8'6", reduces to 51" for short cuts and portability. Clamps to paneling, doors and other long work. Rip 4'x8' sheets down the center, trim 1/16" off a door. Make precision 90° cuts, tapers, angles, dados, bevels, grooves. Unbeatable for scoring wall-board. Guides utility knife. Here's how this sturdy aluminum tool works:



(1) Patented connector joins and aligns (2) two 51" guide sections with four set screws (3) C-clamps (4) attach guide to work. Tool follows guiding edge (5) Clamps and illustrated instructions incl. only \$19.95 plus \$2.00 shipping and handling. U.S.A. only. Send check or M.O. to: R.A.K. PRODUCTS, Department M-41 Box 23426, Milw., WI 53223. MONEY BACK GUARANTEE. Wis. Res. 4% tax.

NEW! VERTICAL MILL

Write for free literature on our complete line of miniature tools and accessories.

The Ultimate Tool for the miniature machinist. From the makers of the famous SHERLINE 3" Lathe.



FULLY GUARANTEED

MANUFACTURED IN U.S.A.

SPECIFICATIONS

• OVERALL SIZE: 12" x 14 1/4" x 17" high

• WORK TABLE: 13" x 1 1/4"

• TRAVEL: X Axis — 8"

• Y Axis — 3"

• Z Axis — 8 1/4"

• MOTOR: 1/5 Horsepower

• FEATURES: Precision spindle, adjustable pre-loaded bearings, anti-backlash feed screws, fully dovetailed, machined slides, adjustable gibs and ways.

only \$289.50

Excl. San Marcos

SHERLINE PRODUCTS

170 NAVAJO SAN MARCOS • CA 92068 • U.S.A.

Unadorned power tools...they do the same job as tools costing up to 5 times as much.



We skipped the chrome to save you money...but we did not skip anything on performance. Actually, we skipped more than just chrome, we cut out every costly frill that wasn't absolutely needed.

Our tools are not exactly flashy. But in articles covering test results on AMT tools, written by leading publications such as Popular Science, our tools have been praised over and over again. In spite of their low prices, our tools are full scale and offer full performance and precision.

HERE'S HOW WE DO IT... First, we don't claim our tools should sell for five times the price! Just that our tools do the same job...with the same accuracy, ease and speed...and will last at least as long. AMT tools cost less to make and are sold direct. They are bona fide quality power tools used by serious amateurs and professionals alike and if sold in retail stores would be much higher in price. We use no magic, let's be specific:

SIMPLICITY... AMT tools are soundly engineered to eliminate every frill and gimmick—to minimize material and production costs. Machined parts are used only where they're needed. Unadorned cast iron and aluminum save you a fortune.

DIRECT-FROM-FACTORY SAYINGS... You save a bundle, yet we offer a double guarantee backed by a 45-year-old company with millions of satisfied customers...and hundreds of orders pour in daily. **LARGE VOLUME...** Our own foundry and large mass production facilities plus large buying power all work to keep costs down.

STANDARD PARTS... Our designs use standard hardware items wherever possible. By avoiding custom-made parts we pass on tremendous savings to you.

If you are looking for power tools that perform like units costing many times our low prices, order today and you'll be one step closer to many hours of woodworking satisfaction.

Bill Monte

JOINTER-PLANER... 4" x 22". Cast iron and steel, precision ground adjustable tables. For planing, joints, bevels. Cuts to 1/4" depth. Fence adjustable 0° to 50°. Steel knives, dual guards. Use any motor. Precision ball bearing industrial model, \$14.65 add'l. Wt. 19 lbs., f.o.b. factory.



\$54.85

TWO GUARANTEES

10-DAY MONEY BACK GUARANTEE
Try any of these power tools and compare it with any similar machine at any price. If not satisfied, return it for prompt, no questions asked refund. We pay the return shipping charges.

10-YR. FULL SERVICE GUARANTEE
Any part or parts of these AMT power tools (except motor which carries a one year guarantee) which become inoperative for any reason within ten years after purchase date will be repaired or replaced by the factory with no cost to the purchaser other than postage.

AMERICAN MACHINE & TOOL CO.
4th & Spring St., Royersford, Pa. 19468

AMERICAN MACHINE & TOOL CO., Dept. PM20 Royersford, Pa. 19468
Please send me the units checked. Payment in full enclosed \$_____ or \$5 deposit each item enclosed, balance C.O.D. I must be fully satisfied or will return unit within 10 days for full refund. No questions asked.

- ☐ 8" Power Saw at \$44.60
☐ Standard Rip Fence at \$6.50
☐ Long Cabinet Rip Fence at \$7.50
☐ Ball Bearing Spindle at \$9.75
☐ Belt Sander at \$44.50
☐ Disc Sander Attachment at \$14.50
☐ Mitre Gauge for Sander at \$2.95
☐ Jointer Planer at \$54.85
☐ Ball Bearing Spindle at \$14.65

NAME _____

ADDRESS _____

CITY _____

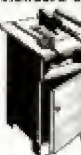
STATE _____

ZIP _____

NOTE: Take advantage of these same low prices at our Royersford factory showroom at 4th and Spring Sts. (9 to 4:30 weekdays, 9 to 12 Sat.).

Brand new electric motor
developing full 1 h.p. 17 lbs. (Purchased separately, \$44.85). With any AMT machine here, f.o.b. factory **\$39.60**

POWER SAW 8" till arbor saw... Cross-cuts, rips, mitres, cuts, compound angles, dados, cores, moldings. Completely assembled with ground cast iron table, safety guard, splitter, mitre gauge. Less blade, motor. Rip fence for easier work alignment: \$6.50 add'l. Ball bearing model, \$9.75 add'l. Takes 1/2 h.p. motor or larger, standard blades, attachments. Wt. 22 lbs., f.o.b. factory.



FREE OFFER, cabinet base plans... plywood, convert your \$44.60 saw into a floor model with a huge 27" x 24" top. Takes cabinet rip fence, \$7.50 add'l. **\$44.60**

BELT SANDER A precision unit. It changes from horizontal to vertical in seconds. Heavy, sander includes 4" x 36" sanding belt. Uses 1/2 h.p. or larger motor; V-pulley drive and multi-purpose drive spindle. Disc sander accessory, \$14.50 add'l. Mitre gauge, \$2.95 add'l. 18 lbs., f.o.b. factory. **\$44.50**



4' WOOD LATHE... 12" swing. Industrial size, does same job as \$75 units. Tubular steel bed rails, screw action tail stock, 3-speed pulley. Use any motor. 3 high speed turning chisels, \$8.50 add'l. 4" face plate, \$2.90 add'l. 30 lbs., f.o.b. factory. **\$59.00**



Set of 8 turning chisels \$23.00
DELUXE BALL BEARING 4' WOOD LATHE... 12" swing, similar to 4' model with heavy duty, double shielded, lubricated-for-life ball bearings. 3 high speed turning chisels, \$8.50 add'l. 4" face plate, \$2.90 add'l. 30 lbs., f.o.b. factory. **\$71.00**
Set of 8 turning chisels \$23.00

LONG BED (\$57) WOOD LATHE Industrial version of deluxe ball bearing lathe above. Lathe has ball bearing live center in tail stock and extra-heavy wallled oversize bed tubes. Set of 3 high speed turning chisels, \$8.50 add'l. 4" face plate, \$2.90 add'l. 40 lbs., f.o.b. factory. **\$87.50**



WOOD SHAPER KIT Makes beads, coves, moldings, tongue-and-groove joints, etc. Accurate cuts at high speeds. Sealed greased-for-life ball bearings. Less wood. Takes 1/4 h.p. motor or larger, standard cutters. Optional hold down assembly, \$4.50 add'l. 9 lbs., f.o.b. factory. **\$34.90**



BUY DIRECT
...USE THIS HANDY ORDER COUPON NOW

Super Magnet Lifts 100 Pounds

Powerful, pocket-size magnet lifts up to 100 pounds of steel. Tested & proven on steel blocks! Stronger than any other magnet of comparable size. So pressure hunting. Do amazing stunts. Fish underwater. 1001 uses. 2 sizes & styles: 60 lb. lift magnet, 2" long, \$3.78 each; 100 lb. lift magnet, 4" long with handle, \$5.95 each. Add \$1.50 shipping & handling. Johnson Smith Co., Dept. 102, 38078 Automation, Mt. Clemens, Mich. 48043



\$2.95



Wire Bending Tool

Work wonders with any wire! New tool bends, curves, straightens, forms any angle, arc or circle. Makes useful & decorative forms for home, shop, office, etc. Pocket size, live coast, simple in design, yet gives in performance. Use coil hangers or any type metal or copper wire up to 14" to make hooks, brackets, braces, handles, fun designs, etc. — any design you want, easy & fun. \$2.95 each, 2 for \$5.25. Add \$1.50 shipping & handling. Johnson Smith Co., Dept. 102, 38078 Automation, Mt. Clemens, Mich. 48043

Self-Stick Rainbow Letters

Diffraction Mylar Metallic Letters. Reflect in a rainbow spectrum of dazzling & changing colors. For any do-it-yourself lettering. Use on doors, mail boxes, tool cases, clippers, lockers, recreational vehicles, signs, CB lettering, etc. 1001 uses. Just peel off & stick on any smooth surface. Pack contains 100 1" letters, numbers, symbols. \$2.75 each, 2 for \$4.99. Add \$1.50 shipping & handling. Johnson Smith Co., Dept. 102, 38078 Automation, Mt. Clemens, Mich. 48043



FREE 1800 **NOVELTIES TRICKS & JOKES**
Things You Never Knew Existed
Send today for FREE world famous catalog. Latest Edition. Full of all the latest & greatest novelties. Pages of novelties, gag gifts, jokes, puzzles, games, stunts, party favors, etc. All the latest & greatest novelties. Add \$1.50 shipping & handling. Johnson Smith Co., Dept. 102, 38078 Automation, Mt. Clemens, Mich. 48043

AMAZING ELECTRONIC PRODUCTS

Leaves super powered, burning, cutting, rime, pistol, pocket-size in dark-shooting directional mike—unscramblers—giant tools—Stunwand—TV disrupter—energy producing, surveillance, detection, electrifying, chemical, ultrasonic, etc. —over 1000 items. Hundreds more—ALL NEW PLUS INFO UNITED PARTS SERVICE. **CATALOG INFORMATION unlimited** \$1. DEPT. NO BOX 718 • AMHERST, N.H. 03051

CLOCK COMPONENTS
Clock Movements: Battery, Quartz, Electric, Urges Grandmother, Grandfather, Westminster & Triple Chime, 8 Day Key Winder & Westminster, Bim Bams, Barometers, Metal, Bezel, Paper dials, Hands, Brass & Plastic Numbers & Markers. Hundreds of Items. Quantity Prices. Send \$1.00 for 60 Page Catalog. Refunded on \$10.00 order.
NEWPORT ENTERPRISES, INC. Dept. A
2313 West Burbank Blvd., Burbank, Calif. 91506

DON'T GET SOAKED USE DRY DUCK HOME WATER REPELLANT TREATMENT
You can use DRY DUCK for your machine washable garments to produce a water repellancy superior to any treatment available. One bottle treats 2 lbs. of clothing and will keep you in dry comfort on those rainy days. Send your name, address with Zip and \$2.50 (check or money order) to:
FAS TECH, 601 Carter Avenue, Woodbury, NJ 08096.

Full-Size FURNITURE PLAN 18th Century PINE CRADLE

Authentic 18th century design. All joints hand-peged like the original 36" long, 29 1/2" high. Perfect for fire-place wood, magazines, baby, tool A woodworker's delight. Plan #120 **CATALOG \$1** only \$5.00. prof. plans—\$1.00. **FURNITURE DESIGNS, Dept. PP-20** refunded with 1st order. 1425 Sherman Avenue, Evanston, Ill. 60201

BUY STAINED GLASS SUPPLIES DIRECT FROM MANUFACTURER
Came Leads, Glass, Solder and Tools!
Everything you need for the professional or beginner. Wide selection of tools and materials with instructions all in our exciting new catalog. For your copy send \$2.00, refundable with first order. Satisfaction guaranteed.
CORAN-SHOLES INDUSTRIES
509 E. 2nd St., Dept. PM So. Boston, Mass. 02127
(617)284-3780

CLASSIFIED ADVERTISEMENTS

Rate: \$4.00 per word payable in advance each insertion. Minimum insertion ten words. Bold face capitalized words—\$1.00 per word additional (First word set in Bold Face at no extra charge, Zip Code Free.) The next available issue to place an advertisement in America's No. 1 Classified Section is APRIL. The closing is FEBRUARY 5th.

Send remittance payable and order to Popular Mechanics, ATT.: Hildegard E. Kappel, Class. Adv., Mgr., 224 West 57th Street, New York, New York 10019. Please indicate Heading under which ad is to appear. As a consumer service and in cooperation with our mail-order advertisers who use post office box addresses for their convenience in handling your order, Popular Mechanics maintains a register of such mail-order advertisers containing their complete names and street addresses.

To avoid delay in the publication of your ad, please send descriptive materials with your request.

AUTOMOBILES

GASOLINE MILEAGE INCREASED DRAMATICALLY! Details FREE! Toll-free recording, 1-800-446-8289 anytime. Technering, Box 121918, Norfolk, VA. 23502.

INCREASE, even **DOUBLE** your car's life and economy! 52 page manual shows how. Guaranteed. Order NOW! J3. Prestige Enterprises, Dept. PM28, 2316 McCormick, Great Bend, KS 67530.

HOW TO SAVE GASOLINE. 25¢. HenCo, Box 3804, Seminole, Fla. 33542

DISTILL LIQUID ENERGY. Power your vehicles and home. Outstanding wood burning alcohol fuel still. Detailed plans, materials list, and farmers mash formulas included. \$15.00 — Hursand Associates, Box 213, Wayzata, Minnesota 55381

BUY — SELL — TRADE any car, RV, etc. Hundreds available/wanted. Current Listings book \$1.00. **FINDERS AUTO EXCHANGE**, Box 2245, Springfield, Virginia 22152

14" TOW CABLE, 14" Galvanized Aircraft Cable 5/16" Forged Hooks \$7.95 P.P. — Tow-Tek Industries, P.O. Box 161A, Abington, Conn. 06230

MPG INCREASED 30% + !! No gimmicks — no gadgets. Professional secrets revealed. Free details — Posco (#802), Box 300, LeGrangeville, N.Y. 12540

NEW Car Free Yearly! Workable Secret Method! — Free Information: Supercar, Box 28101PM, St. Louis, MO 63119

MINI-TRUCK INTERIOR KITS!!! Push SEAT COVERS & DOOR PANELS \$75.00. CARPETS \$35.00. Also Carpets, Headliners, Tops, Sportscar Seat Covers, etc. for all Cars. **THE TUFTER**, Box 971, Fallbrook, Calif. 92028

THE ALCOHOL BOOK — New Fuel For Your Car. Make Your Own. \$9.95. White Specialties, Box 1306, SCR, Big Spring, Texas 75720

RUN CAR, TRUCK, TRACTOR ON WOOD! Illustrated Report \$5.00. Sweatt, Box 591, Titusville, FL 32780

MOTALOY Ring-Valve Repeating Job—\$6.00. Money-Back Guaranteed! Free Brochure! Arrow Products, Box 374M, Broken Arrow, OK 74012.

"SPERRY-OWENS TEFLON MOTOR TREATMENT." Free Details. Write: Handley, Box 216PM, Magnolia, Texas 77355

NEW! SCIENTIFIC DISCOVERY GUARANTEE'S Better Gas Mileage and Increased Horsepower. Free Details. Motor-Life, P.O. Box 30053, Chicago, Illinois 60630

GASOLINE SHORTAGE? Run your car on Propane or Gasoline by Flipping a Switch. Choice of two Propane Systems. Cost Around \$50.00. Installation Details—\$10.00. Gac Engineering, Box 266, Owls Head, Maine, 04854

PROFITABLY SELLING YOUR CAR, TRUCK, RV! Booklet \$3.50. Rork Enterprises, 3320 Glendora, Bay City, Mich. 48706

AMAZING NEW INVENTION INCREASES MILEAGE UP TO 25%. Start saving gallons of gas every week with the **MILEAGE-MINDER**. Installs in two seconds. No tools or connections required. **IT REALLY WORKS!!** Money back guarantee. Send check or M.O. for \$14.95 plus \$1.50 for mailing costs to **AUTO-SCIENCES**, P.O. Box 6008, Orange, Ca. 92667

STOP Battery Corrosion—Eliminate Corrosion Buildup on Automobile Batteries. Construction Equipment, Semi-Trucks, Boats, etc. A Liquid Product. Non-Toxic, Non-Irritant, Non-Flammable Money-Back Guarantee. Send \$5.00 Check or Money Order. Konkor Krode Inc., P.O. Box 162, Midvale, Utah 84047

LECTRICAR — Convert VW's, Fords to electric 50 mph plans \$25.00. Info. \$1.00. Robert Bucy, Box 28794, Dallas, Tx. 75228.

SPACE-AGE AUTOMOTIVE BREAKTHROUGH! One-Time-Only Permanent Engine Treatment increases gas mileage while reducing engine repairs. Six iron-clad, unconditional guarantees. Amazing Details. RFD Enterprises, 2320 Southwood, Dallas, Texas 75224.

FREE Brochure, UNKNOWN FACTS Why your car is a gas Guzzler! Hartnell Diagnostic Clinic, Box 446, Centralia, IL. 62801.

75 MPH! Amazing Build-It-Yourself Hybrid Electric Car can Travel at 90 MPH... takes less than 40 Hours to build... and costs just \$1500! Complete plans (including Schematics, Materials List, and Components Sources) are available from **THE MOTHER EARTH NEWS**. Send Check or Money Order to: **MOTHER'S PLANS**, Department PMG, P.O. Box A, East Flat Rock, North Carolina 28726.

SAVE GASOLINE — SAVE MONEY — Excellent manual tells how — Pictures, Tables, Sketches. Outstanding text. Act NOW, send \$2.95 to: Management Energy Resources Inc., Drawer T, Dept. PM-2, Cape Canaveral, Florida 32920

SECRETS OF THE 200 MPG CARBURETOR! Patent Drawings and Instructions \$10.25—Money Back Guarantee. Roadrunner Publications, Raymondville, Texas 78580

MAKE ALCOHOL FUEL LEGALLY!! Solar/conventional still plans and formulae. Details on Federal Permit! only \$10.00. RDA, Box 873, Concord, NC 28025

ALCOHOL Cookbook — Your complete Alcohol Fuel Manual. Free Details. Tormon's, Box 788, Asheville, NC 28802

FORGOTTEN Carburetor Patents! Write! Lindsay, Box 12-IL, Bradley, IL 60915

THE COMPLETE CAMARO BOOK from A through Z-28. Hardcover, 144 pages, 312 photos. Satisfaction completely guaranteed. \$16.95 postpaid. Lamm-Morada Publishing Co., Box 7607-FC, Stockton, Calif. 95207.

PROPANE Conversion — Cars — Trucks. Return to gasoline anytime while driving. Uses regular refillable trailer tanks. No engine modifications. **COMPLETELY PROVEN — TESTED — THIS SYSTEM WORKS!** Uses inexpensive LOCALLY available parts. Engineered for amateur mechanics. Build for around \$50.00 in two days with ordinary hand tools. Satisfaction **ABSOLUTELY GUARANTEED** or immediate refund. For complete plans **RUSHED** First Class, send \$10.00. Fleming Engineering - PM-6, RD1, Remsen, New York 13438

NO GASOLINE AVAILABLE!!! Prepare yourself. Build a woodgas-generator like the one which kept vehicles running during the **NO GASOLINE** - period of W. W. 2. Old inventions. Re-discovered in the archives of Europe. Drawings and details \$5.95 to: **GEN-GAS**, Box 671, Chatsworth, California 91311.

GASOLIN GUIDE PLUS Alcohol-making Manual. Both, only \$2.00. Gourmet, 5133 Fairhill, Philadelphia, PA 19120.

HEADLIGHT Alarm. Free Information. C&C Industries, POB 804, Forked River, NJ. 08731.

STOP AUTO THEFT WITH GARD-A-CAR. Stalls Engine Dead in 8 Seconds. Easy Installation. Satisfaction Guaranteed. \$19.95 each. Illustrated Report \$2.00. Deloris Gang, Dept. PM2, 7084 Erie S.W., Navarre, Ohio 44662

NEW! QUICK MORNING START. Heavy 3 Amps. **OVERNIGHT CHARGE** without raising hood—freezing weather. Three parts. **PLANS—\$4.00** German Patent. **TELEVID INTERNATIONAL**, P.O. Box 970, Vancouver, Washington 98666

CONVERT V-8 ENGINES TO V-4 Possible saving 50%, for \$30.00. Simple proven instructions, by Auto Instructor, 30 years exp. Send \$10.00 for complete instructions. Auto Conversion, P.O. Box 153, Madison, AL 35758

ELECTRIC VEHICLES

BUILD — Amazing 4 Wheel Electric Moped! Plans \$15.00. Details \$2.00. Lectran, Box 1648, Largo, Fla. 33540

CONFIDENTIAL Hybrid Car Plans. Information. Get 75 mpg. \$1.00. Catalog Included free. Ideal, Box 1237-EG, Melbourne 32935

ELECTRIC Car conversion manual breakthrough. Exact Step-by-step instruction, Diagrams Drawing. Conversion approx. \$1300.00. Five years Research/Development. \$39.00. Information \$2.00. Mr. Eilers, Box 2781, Santa Clara, Ca. 95051

UNUSUAL Electric Automobile Publications! Write! Lindsay, Box 12-IM, Bradley, IL 60915

AUTO SUPPLIES & EQUIPMENT

PARTS: Army Jeep and truck parts. Spare Parts & Equipment Co., P.O. Box 751, Lexington, Kentucky 40501

GASOLINE Auxiliary Tanks. Pick-up Trucks. Below Retail. Free Details — SASE, National Clearinghouse, 2148 Evans, Bloomer, Illinois 60422

ALTERNATOR/Generator Rebuilding Book. Details: Hedelund Engineering, 7505 Barkentine, Las Vegas, NV 89128.

HARDTOPS For Alfa, Austin Healy, Datsun, Fiat, Jaguar, Jensen Healy MGA, MGB, Midget, Spitfire, Sprite, Sunbeam, TR3, TR4, TR6, TR250—**DYNAPLASTICS**, P.O. Box 4907, El Monte, California 91734

RINGS — Valve jobs — Driving. Free Details, Motaloy, 2532 Superior, Chicago 60612

SNOW PLOW WING: At last, a wing for snow plows on Jeeps, Pickups & other small 4 x 4's. Keep your plowing easy. **MINI-WING™** keeps snow banks pushed back, leaves room to plow the next storm. Manual & Hydraulic models to fit Fisher, Meyer, Western and most others. Send for complete information. C.W. Storey & Co., Inc., **MINI-WING** Div., P.O. Box 242, Dept. 2, Englewood, Ohio 43032

EMERGENCY Adapter. Use Regular Gas in Un-Leaded Tank. \$2.00 to: Webeco, P.O. Box 10943, Pittsburgh, PA 15236

STOP AUTO THEFT! NOT AN ALARM! Simple, Low-Cost, Do-It-Yourself — Guaranteed! Free Details. Write: Pinhurst Mart, 280 Dundas E. (622), Toronto, Ontario M5A 3W1

MAKE YOUR OWN GASOLIN — Requires only 8 Square Feet Garage or Backyard Space. Easy. Engines Run Cooler, Powerful, Longer. Instruction Manual \$10., with all needed Equipment \$25. We've used it 15 Years. Gross Racing Enterprises, 1086 Magie, Fairfield, Ohio 43014

PREVENT THEFT How To Make Automobile and Van Hub Cab Locks. Simple Instructions \$1.75. Charles W. Hunter, P.O. Box 176, Brooklyn, New York 11212.

MOTORCYCLES, BICYCLES, MOTORSCOOTERS & SUPPLIES

HONDA \$25.00, Schwinn, \$41.00. Details 95¢ (Refundable). Surplus, 443, Bend, Oregon 97701

PLANS Go-Kart \$2.50, Mini Bike \$2.00, Three Wheeler \$3.00, Soap Box \$3.00. Mini Vehicle, Dept. C2, Chazy, N.Y. 12921

GO-KARTS — Blueprints, Kits or Completely Assembled. Catalog \$3 (Refunded First Order). Gross Racing Enterprises, 1086 Magie, Fairfield, Ohio 43014

HANG GLIDING—AVIATION

SPORTPLANES, MINI-HELICOPTERS, MOTORIZED—HANGGLIDERS. Plans/Kits/Complete. Many Types. Catalog \$3.00. LFP, Dept. A, Box 19828, Houston, Texas 77024

CUSTOM WOOD PROPELLERS For Home-built Aircraft, Airboats, Decoration. Lepper, 6 Khedive Ave., Toronto, Ontario, Canada M6A 2G2

ONE-MAN JET HELICOPTER — Easy, inexpensive to build! Detailed plans, drawings—\$7.00. **HELICOPTER EXPERIMENTER'S HANDBOOK**—\$4.00. Both—\$10.00. Helicraft, Box 3053, Redondo Beach, California 90277

SPACE & ASTRONAUTS

ANTI-GRVITY Propulsion Device. Free Brochure! RDA, Box 873M, Concord, NC 28025

HOVERCRAFT

AERO-CAR Amazing Hovercraft built easily with ordinary tools. Lawnmower engine power. Carries one man plus. Hovers, flies forward, backward, sideways over land/snow/water. Complete construction plans and brochure. \$7.95. Aero-Projects, Box 5118PM, Clinton, New Jersey 08809.

HOVERCRAFT Plans All Sizes. Catalog \$1.00. Universal Hovercraft, Box 281, Cordova, Illinois 61242

HOVERCRAFT Plans, Components—Free Information—Venture, 871A2 Mos, Akron, Ohio 44310

CB-RADIO, TV & HAM EQUIPMENT

GOVERNMENT Surplus receivers, transmitters, sniperscopes, parts, Catalog 25¢. Meshna, Nahant, Mass. 01908

(Continued on next page)

CB-RADIO, TV & HAM EQUIPMENT

(Continued from preceding page)

POLICE Scanners, Crystals, Antennas, CBs, Radar Detectors. HPR, Box 19224, Denver, CO 80219

366 RADIO + TV Tubes. Free Catalog. Cornell, 4213-17 University, San Diego, California 92105.

INCREASE YOUR CB RANGE — LEGALLY! Free information. "SKIPPER", Box 130-82, Paradise, Calif. 95969

CB TUNER/MODIFICATION REPORTS. Simple, non-technical. \$6.00 each, specify model. Free catalog! Plans, kits, books. **CB CITY**, Box 1030M, Woodland Hills, CA 91365

FREE Educational Electronics Catalog. EduKits Workshop, Department 8028, Hewlett, New York 11557.

GIANT SCREEN TV. Projection system kit includes lens, plans, instructions. \$16.00. Guaranteed. ADP Enterprises, Box AW-1, Brisbane, CA 94005

ELECTRONICS

TRS-80 INTERFACING. 254 Page Book Tells All, \$9.95 Postpaid. Group Technology, Box 871, Check, Virginia 24072.

PRINTED CIRCUIT BOARDS From Sketch or Artwork. Kit Projects. **DANCING DOTS, INC.**, Box 261, Westland, Michigan 48185

MECHANICALLY INCLINED INDIVIDUALS! Assemble electronic devices in your home. Knowledge or experience not necessary. Get started in spare time. Above average profits. \$300-\$600/wk. possible. Sales handled by others. No investment - Write for free details: **ELECTRONIC DEVELOPMENT LAB, BOX 1580PM, PINELAND PARK, FL 33585**

SPEAKERS!!! Sources List. \$1.00! Reaser (PM), Box 4951, Montgomery, AL 36103

HIFI, TAPES, PHONOGRAPHS, RECORDS

RECORD-TAPES! Discounts to 73%; all labels; no purchase obligations; newsletter; discount dividend certificates; 100% guarantees. Free details. Discount Music Club, 650 Main St., Dept. 1-0280, New Rochelle, New York 10801.

BUILD Beautiful 30" Speaker Cabinets. Professional Design. You Select Speakers. Plans \$3.50. **ALLWEST PRODUCTS**, P.O. Box 822, Chino, CA 91710

OLIVES- 45 RPM Original Hits. Catalog \$1.00. C&S Record Sales, Box 197, Wampsville, New York 13163

FREE Catalog—Electronics Kits—Amplifiers—Pre-amplifiers—Psychedelic Strobes—SCA Adaptors—Color Organs—Digital Instruments—Guitar Amplifier. FREE Subscriptions. SWTPC, Box PM32040, San Antonio, Texas 78284.

MOTION PICTURES & SOUND EQUIPMENT

16MM Films, Videotapes, Bargains. Urbanski, 8142 S. Kennedy, Chicago, Illinois 60652

SUPER 8, 16mm & 8mm Full-Length Features and Digest Films in Color and Black/White, Rock Movies. Jack Nicholson, Sherlock Holmes, Bogart, Selznick. Hundreds of Titles. **FREE Illustrated Catalog.** MILES, Box 1576PM, South Bend, Indiana 46634.

CAMPERS & TRAILER KITS—PLANS

R-V KITS — PLANS — PATTERNS — Campers — Trailers — Fifth Wheels — Vans — Covers — Motorhomes. Simple construction. Save! R-V Kits/Equipment catalog \$1.00. Glen-L R-V's, 9152PM Rosecrans, Bellflower, CA 90706

BOATS, OUTBOARDS, TRAILERS & KITS

BOATKITS — PLANS — PATTERNS — FRAME-PACKS — Materials — World's largest catalogues — 300 "Oneon" designs 8' — 30' in fiberglass and plywood etc. POWERBOATS — Inboards — Outboards — Jets — Cruisers — Sportfishers — Hydroplanes — Runabouts — SAILBOATS — Daysailers — Trailer-sailers — Motorsailers — (KAYAKS — CANOES — 40 models) BOATBUILDING MATERIALS — Hardware — Fastenings — Sails — Plywood — SPECIAL SECTION ON FIBERGLASS — resins — foam epoxies — mats — Cloth. Catalogues \$1.00 (with Boat-builder's Guide \$2.00). **CLARKCRAFT — 16-P — Aqualane — Tonawanda — NY 14150**

KYAKS — CANOES — PLANS — KITS — Patterns — Materials 40 models in fiberglass — plywood canvas Catalogues with "Boatbuilder's Guide" \$1.00 — **CLARKCRAFT — 163 Aqualane — Tonawanda — NY 14150**

BOAT PLANS — For amateurs — Catalog \$2.00 Naval Architect, Box 2551-F, LaHabra, CA 90631.

EVINRUDE 1979 Bargains . . . all sizes . . . Scott McCulloch parts . . . \$1. handling . . . Electra Marine, 610 Merrick Road, Lynbrook, New York 11563

BOAT PLANS — FRAME KITS — PATTERNS — Huge 140-page catalog! Powerboats — Sailboats — Outboards — Jets — Rowboats — Houseboats — Runabouts — Dorries — Workboats — Racing Boats — in plywood — Cold Molded — Wood/Epoxy — Fiberglass — 8' to 49'. Lowest cost, highest quality for 27 years. Easy, proven methods include instructions especially for amateurs. No lofting! **"BOATBUILDING SUPPLIES" — Fastenings — Fiberglass — Resins — Glues — Equipment — Spars — Books — Boat Trailer Plans. Send \$2.00 for catalog plus free "Boatbuilding Supplies" brochure. "Inboard Marine Hardware" catalog also \$2.00. Glen-L Marine, 9152 Rosecrans, Dept. MP, Bellflower, CA 90706**

FIBERGLASS — RESINS — Foams — glass — epoxies — mat — etc. Factory prices — Catalogue \$2.00 — Book "Complete Fiberglassing" \$5.00 — **CLARKCRAFT — 16-P1 Aqualane — Tonawanda — NY 14150**

GAS SAVER DORY SKIFFS
FREE Plan "Gloucester Gull" Rowing Dory with Brochure/Photos — 50 Plans 15/45 Ft. Power & Sail — Only \$1.00. Air Mail \$2.00. Texas Dory, Box 720, Galveston, Texas 77553

BOAT KITS — 22 trailerable models — POWER and SAIL — 16'-30'. Molded fiberglass hulls and decks come factory assembled — you install factory supplied interior. Save half factory-built cost. No experience required. **FREE catalog. Luger, Dept. BC-80, 3800 West Highway 13, Burnsville, Minnesota 55337 — (612) 890-3000**

AUTOMATIC Reverse Lock: Johnson, Evinrude. Info: \$2.00. Box 368-M, RT. 2, Pierre Part, Louisiana 70339

PLANS (280), Patterns, kits, Catalogs: Powerboat, \$2.00, sailboat \$1.00. Marinecraft, Box 161-M, Brighton, Mass. 02135

CAMPING EQUIPMENT & TENTS

ALCOHOL cook stove. For emergencies, backpackers, outdoorsmen. Efficient, lightweight. No moving parts. Send \$10.70 to: TWM Enterprises, Box 266P, Wilton, CT 06897

FREE Catalog. Everything for camping. Campmor, Box 407N, Bogota, New Jersey 07603

ATHLETIC & BODY BUILDING COURSES

INCREASE Height! Details 35¢. Tail-Up (30010), Box 32307, Louisville, Kentucky 40232

PHYSICAL Fitness Newsletter. Dept. 40, P.O. 195, Western Springs, Illinois 60558. Introductory copy.

SPORTING GOODS & EQUIPMENT

BOOMERANGS — INCREDIBLE RETURN! Exciting sport. **FREE catalog.** 30 designs. books, BoomerangMan, 306 Park, Monroe, LA 71201

ARCHERY Lowest Discount Prices. All top brands. Orders shipped same day received. Money-back guarantee. World's Largest Supplier. Free catalog. Anderson Archery Corporation, Grand Lodge, Michigan 48837

BATTERIES, GENERATORS

SURPLUS A.C. Generators 110V., 60CY. Catalog \$2.00 (Refundable). Box 3904, Las Vegas 89030

ENGINE Generator 1250 Watts, \$299 Postpaid. Other Sizes. JJ Enterprises, Box 693, Oshkosh, Wisconsin 54902

ENGINES, MOTORS, MAGNETS

REWIRE Car Alternator for 170 AC. Plans \$3.00. Swatt, Box 591, Titusville, Florida 32780

REPAIR ELECTRIC MOTORS! GENERATORS! ALTERNATORS! Details! Modquip, Box 7266, Kansas City, Missouri 64113

GRAVITY TURBINE. Functioning without Gas. Power Cars. Send \$1.- for information & Drawings. Eddy Saballos, Apartado 2877, Caracas 101-Venezuela

REWIND JUNK TRANSFORMERS for any voltage! Manual shows how. \$3.00 Guaranteed. Harrit, Box 495, Great Neck, N.Y. 11022

TOOLS FOR SALE

UNIVERSAL Wrench, 3/4"-13/16" \$4.98. Lakewood Ltd., Box 9026-W, Reno, Nevada 89503

ALL-IN-ONE WRENCH. Adjusts automatically 3/4" to 13/16". Ratchet like action. Chrome plated steel. Guaranteed. \$5.95 postpaid. White Mountain Gifts, 21P Adams St., Berlin, N.H. 03570

MACHINERY, TOOLS & SUPPLIES

1600 CATALOGS listed and described. Sources for everything imaginable. \$3.00. Masterlog, Box 879, Fairfax, California 94930

LOG SPLITTER Hydraulic SHP 12 Second Cycle. Free Brochure. Paragon Splitters Inc., 3601 Cindy Lane, Seven Hills, Ohio 44131

4" METAL Cutting Lathe \$68.90. Taig, 15048 Proctor, Industry, Calif. 91746

BANDSAW BLADES. Any Size. Free Pricelist. Parker, 8921HY49, Sonoma, Cal. 95370.

MACHINEX — Unimat — Maximat — Sherline Lathes, Mills. Catalog \$1.00. Shop Supplies \$1.00. Campbell, 1424 Barclay, Springfield, Ohio 45505

BANDSAW BLADES. Carbide Tipped Saws. Any size. Free literature. King Saw, 6541 Tidewater Drive, Norfolk, Virginia 23509

COMPLETE MITERING EQUIPMENT for Perfect Picture Frames for under \$250.00. Hobby or Pro. Pootatuck, Box 18, PM2, Windsor, Vermont 05089

TAP ALUMINUM WITH EASE! Tapping Solution Complete with instructions Send \$5.95 To: Scherrer Instruments, Inc., 7170 Manchester, St. Louis, Missouri 63143

TECHNICAL Publications! Lathes, hydraulics, blacksmithing, steam engines! More! Catalog! Lindsay, Box 12-IP, Bradley, IL 60915

SMALL FOUNDRY Furnaces. Supplies. Free literature. Pyramid Products, 3736 South 7th Avenue, Phoenix, Arizona 85041

MILLING Cutters, lathe milling attachments. Catalog \$1.00. Potter, Box 73, Cedar Rapids, Iowa 52406.

LUMBER/MAKER® And your chain saw makes lumber and Cabins from Logs right where they lie—full details write: Haddon Tools, 4719 Route 120, McHenry, Illinois 60050

MILLING MACHINES. Affordable. **QUALITY PROJECTS.** Vertical \$4.95. Horizontal \$4.95. Both \$7.95. (Vise Plans Included). **NU-DESIGN COMPANY,** Box 6344-F, Santa Ana, California 92706

BLACKSMITH & FOUNDRY SUPPLIES

FORGES: gas, coal—hammers—tongs—anvils— anvil benches—all blacksmith supplies. Catalog \$1 (refunded first order). Mankel Blacksmith Shop, 7836 Cannonsburg, Cannonsburg, MI 49317.

ENERGY SAVING

METHANE, WIND, SOLAR, FUEL CELLS. Enjoy free heat & power send for energy encyclopedia. A list of mfg., costs, specs., on alternate sources of energy. Plus catalog of plans, books, & energy saving devices for the do-it-yourselfer. Send \$4.00 to: Energy Service, 14a Hughey Ave., Nashua, N.H. 03060

WOOD Stove — Weld your own Attractive High Efficiency Stove. Complete instructions \$6. Sea Wind Supply, 15668 Virginia Pt. Rd. N.E., Poulsbo, WA 98370

SOLAR POWERED INDOOR CLOTHES DRYER, and Indoor Garden. Fresh Vegetables Year 'Round. Easy Plans \$3.00. Guaranteed. Dedson, 3218A Shasta Way, Klamath Falls, Oregon 97601

CONCERNED ABOUT HEAT LOSS FROM YOUR RESIDENCE OR COMMERCIAL BUILDINGS? Send for informative booklet which describes principles utilized in modern Alaskan building designs. \$4.00. Northern Technologies Engineering, Box 73916, Fairbanks, Alaska 99707

SAVE ELECTRICITY. NEW NASA INVENTION. HAWS, 400 W. 4th, Odessa, Texas 79761

HEAT YOUR HOME FOR \$40. Energy Guide \$1.50. Energy Institute, 37 Hamilton Street, Boston, Ma. 02125

CENTRAL HEAT FROM WOOD! Wood-burning boilers heat whole house, yield hot water! Details: Tekton Corporation, Box 995, Conway, MA 01341.

INCREASE Your Fuel Economy. I'll show you how. Send \$3.98 to Gas Saver, 17244 Barben, Fontana, CA. 92335

SAVE up to 25% on Heating Bills. Plans \$5.00. Heatco, Rt. 6, Box 432, Staunton, Virginia 24401

HOW to cope with rising energy costs? ENERGY MANAGEMENT DECISIONS offers proven dollar-saving solutions monthly. Sample copy \$2.00. ENI Publications, Dept. MC, Box 9430, Phoenix, Ariz., 85068.

SAVE MONEY! Easy Thermosetback Plans \$3.50. Joyce, Box 41454M, Chicago 60641

SOLAR & ALTERNATE ENERGY

AMAZING Forced Air Wood Heater. Supplement your furnace or use alone. Fiberglass Storage Tanks 100 to 6,000 Gallons. Write: Box 3, Rockton, Illinois 61072

(Continued on next page)

SOLAR & ALTERNATE ENERGY

(Continued from preceding page)

PREPARE FOR THE COMING SOLAR BOOM! Read Solar Energy Digest, Box 17776-PM, San Diego, CA 92117.

SUN TRACKING SOLAR COLLECTOR! Worlds Most Efficient System. Send for—Plans/Parts/Complete units. Ross Solar Systems, Medina, Washington 98039

ENERGY INTEGRATION — Book on Alcohol, Methane, Electricity & Solar Systems for Homesite Energy Production. \$2. AlEnsy, Rt. 2, Box 43, San Marcos, Texas 78666

SOLAR Heating with Easily Obtained, Inexpensive Materials. For Plans Send \$3.00 to: Miller, 5801 West Cascade Drive, Franklin, Wisconsin 53132.

SAWDUST Burning Heaters. Plans \$4.95, Arpad Gelanyl, P.O. Box 382, Los Banos, California 93635

SAVE MONEY! Heat Water, Home with Solar Energy. Complete Monthly Coverage of Plans, Government Subsidies. **SOLAR HEATING NEWSLETTER.** Year \$6.50; Money-Back Guarantee. 39 Whipoorwill, Bethel, Connecticut 06801

PLANS — Solar Heater for Less than \$3 Total. Plan Cost \$2.50. Dan, Rt. 1, Box 193-C, Cochrane, WI 54622

MAKE AND TEST Your own SOLAR COLLECTOR NASA engineer writes manual simple enough for science fair projects. Send \$4.95 to: 422 Shadow Creek, Seabrook, TX 77586

KALWALL'S SOLAR HEATING CATALOG! Full Line of Solar Heating Components, Including Sun-Lite® Glazing and Tubes. Order all Materials from one Source. Send \$2.00 for Catalog. Solar Components, Dept. M, P.O. Box 237, Manchester, New Hampshire 03105

DOES YOUR WOOD STOVE MAKE ELECTRICITY? IT CAN! Simple Wood Stove Powered Electrical Generator. Assemble with local parts for under \$100.00. No Machining or Welding. Plans, Pictures, Instructions, \$10.00 US. Brochure of Steam Engines and accessories \$3.00 US. **STEAM POWER PRODUCTS**, Rt. 2, Dept. PM, Koskonong, Missouri 65692

SOLAR Window Thermosyphon Saves Fuel Costs. Construction Plans \$5.00. 2032 Park, Baltimore, Maryland 21217

BUILD Electric Automobiles, Woodstoves, Windmills! Moral TECHNICAL CATALOG! Lindsay, Box 12-IX, Bradley, IL 60815

BUILD A SOLAR WATER HEATER — 40 Page Instruction Manual With Blueprints \$8.00. Sunwise, Box 1433, Alamosa, Colorado 81152

SOLAR ENERGY Opportunities Report—\$3.00. Satisfaction Guaranteed. William Brace, 8225 Encino, Northridge, California 91325

1980 SOLAR DIRECTORY—Your guide to the Industry! Examines Current Technology, Lists Manufacturers of Greenhouses, Pool Heaters, Complete Systems and More. \$6.25. **INTERNATIONAL SOLAR CONSULTANTS**, 177 MacDougal, New York, New York 10011

HOME HEATING, FUEL SAVERS

"FREE" Heat — Burn used Crankcase Oil/Free at many Service Stations/In your Home-Built Stove. Inexpensive, Easy to Build. Instructions \$10.00. D. Lindell, Box 48, Oak Park, Minnesota 56357

FUEL OIL SAVER! Oilburning additive saves 20%! Formula, Instructions, \$2.00. Gourmat, 5133 Fairhill, Philadelphia, Pa. 19120

WOODSTOVE/FIREWOOD manual. Buying, safety, 100 Do's/Don'ts. \$2.50 postpaid. McMill Publishing, 3531 SW 57th, Portland, Oregon 97221

HOME CRAFTSMAN

TURNING SQUARES: Cherry, Maple & Ash. Brochure 50¢ Refundable. Cryder Creek Wood Shoppe, Box 19, Dept. PM-2, Whitesville, NY. 14897.

WOOD LATHE COPY DEVICE — Easy To Build — Plans \$7.00. Marshall Woodworking, 2829 Agricola Street, Halifax, Nova Scotia, B3K 4E5

CREATIVE Fun Building Child's Safe. Changeable Combination. Instructions \$4.00. Box 166, Turlock, California 95360

WOOD! 40 varieties Hardwoods! 4000 Items - Woodshop Tools, Supplies, Kits, Hardware. 152 page 50th Anniversary catalog. 50¢. Craftsman, Dept. AX-20, 1735 Cortland Ct., Addison, IL 60101

PICTURE Framing Supplies—Save 50% making your own frames. Catalog \$1.00. Japs, 126PP Seventh North, Hopkins, MN 55343.

WORLD'S LARGEST CATALOG! Three pounds, 832 pages. Every Tool, Supply, Machine, Imaginable \$5.00. Refundable. McKiligan, PM280, Johnson City, N.Y. 13790

CATALOG FULL-SIZE FURNITURE PLANS — \$1.00. Refunded with first order. Traditional, Early American, over 150! Furniture Designs, 1425 Sherman, Dept., CP-80, Evanston, Illinois 60201.

36 UNUSUAL PATTERNS! Profitable Wooden Gifts, Novelties. Plus "Shop Secrets". Only \$4.00. ACCENTS, 374 Boston (P-2), Topsfield, Mass. 01983

BUILD Magnificent Floral Display Shelves. Special Lighting Encourages Growth. Fun/Profit. Blueprints \$3.00. Floraglow, Box 1234, Taylors, South Carolina 29687

QUICK "Steps" to Accurate Stair Building. \$3.00. "Stairbuilder", P.O. Box 1512, Post Falls, Idaho 83854

FREE HOBBY Tool Catalog. 1,000 Items below Wholesale! International Curio Shoppe, D-64, Box D, Mountaineer, N.Y. 12763

BUILD Your own lathes from old car parts. Plans \$2.90. Free supplement of money making projects included. Lindsay North, Box 251, Oroville, Washington 98844

WOOD FINISHING AS EASY AS 1-2-3 with the famous Sealacell process acclaimed by craftsmen for over 50 years! Send for free Facts booklet and catalog of wood finishing supplies. General Finishes, Box 14363P, Milwaukee, WI 53214

UNIQUE PLANS. Toy Chest, Table and Chairs. \$3.00. **GOUT BOARD.** \$1.00. **FREE** brochure. William Davison, 2238E East Karen, Phoenix, Arizona 85022

CALIFORNIA HOT TUBS — Build for \$150. Also Pumps, Filters, Heaters, Hydrojets at Distributor Prices. Complete Blueprints, Instruction Manual — \$7.50. Tubs, Box 22511D, Robbinsdale, Minnesota 55422

PLYWOOD Aquarium Plans - Instructions \$1.00. DOR-E-SHEL, 6902 Prairie, Middleton, Wisconsin 53562

WOODEN BEARED CLOCK plans! Details. Gordon, 16321 SE Second, Bellevue, Wa. 98008

HOW To Make 100 Decoupage at one time. 12 Pages, easy Instructions. \$3.00. Jay's, Box 442, Kennesaw, GA 30144

BUILD — Stereo Stand — Bookshelf 2x8 feet, from one piece plywood plus trim pieces. Complete plans and instructions \$3.00. Peter Moresch, Honeycave, Middle Road, Paget, Bermuda 6-06

101 PATTERNS. Gifts, Novelties, Action Windmills plus "Make Money Jig Sawing". Only \$4.00 Prepaid 1st. Class. Mastercraft 2SM, P.O. Box 631, Park Ridge, Illinois 60068

CRADLE plans, full size, \$5.00. Furniture plans, illustrated offering \$1.00. Refunded with first order. Williams, Fine Furniture Designer, P.O. Box 6026, Newport News, VA 23606

DRAFTING Table Plans \$6.00 Postpaid 37 1/2"x60", Information — Photos 50¢ Refundable With Order. Anders Designs, Dept. PM, P.O. Box 678, Garner, North Carolina 27529

100 JIG SAW PATTERNS. Full Size Toys, Windmills, Letters, Birdhouses, Shelves, Animals, etc. \$3.00 ppd. 1st class. Hayes Patterns, 6F Willow, Woburn, Ma. 01801.

BRICK or FIELDSTONE BEAUTIFUL WALL FACINGS. Use inexpensive plaster with our realistic molds. Easy directions. Write: Bricmold, 152 Elm Lane, Hicksville, N.Y. 11801

OLD TIME WOODEN TOYS. Plans and Construction Details for 20 imaginative Action Toys. \$3.00. Coast Publications, Box 221, Shawinigan Lake, British Columbia, Canada V0R 2W0.

TOY Plans. Easy, Profitable. List 25¢. Christopher Michael's, Dept. PM2, 151 Rio Grande, Seguin, Tex. 78155

CONSTRUCTION PLANS, BLUEPRINTS

PHOTOGRAPHERS! Save Money. Darkroom Time! Build Your Own Professional Quality Paper Safe. Amazingly Easy! Unique, proven design. Simplified Construction. Step-by-Step, Foolproof Plans! \$2.00. Page Diversity, Dept. A2, Box 561, Seabrook, Maryland 20801

HOME BUILDING & REMODELING

ARCHITECTURAL Consultation, Design, Drafting Services Thru Mail. Write: Panu Architects, 34-14 87 Street, Flushing, New York 11372.

EARTH INTEGRATED HOMES. Beautiful Greenhouse Designs. Cuts Heating and Cooling Bills 100%. Write: Terrasol Systems Inc., RD 2, Box 4166, Newton, New Jersey 07860

CUT COST. Don't waste! Finishing Recroom? Cabin? How many Tiles? Panels? Kit contains new drafting material to work efficiently. Free information or complete Kit ppd. \$12.00 Instructions, Satisfaction Guaranteed. Plan-Kit, P.O. Box 278, Montvale, NJ 07645

LAY your own STONE — easy FormPress Method. Instructions \$2. Stonehouse Stoneworks, Rt. 3, Box 244A, Salem, VA. 24153

BASEMENT WATERPROOFING — Save Thousands — It's easy to do it yourself! You can have a dry basement this spring! Step by step method for any wet basement problem in one easy to follow booklet. Send \$3.95 check or M.O. to: Kaye Co. Inc., P.O. Box 14368, Philadelphia, Pennsylvania 19115. — Pa. residents add 6% sales tax. Allow 3-4 weeks delivery.

SAVE 95% . . . GUARANTEED!!! Installing Overhead Light Fixtures? Save at least 95% of Cost of Hiring Electricians to Install Wall Switches in the Conventional Manner. Unpublished Method Requires no Special Skills. Request **FREE** Copy of Guarantee or Send \$7.95 to: **SWITCHES**, P.O. Box 766 -A2, Englewood, New Jersey 07631.

GET LATEST UNDERGROUND HOMES INFORMATION! Two new books, manual, blueprints. Free color brochure! Underground Homes, 700 Masonic Building, Dept. PM-C2, Portsmouth, Ohio 45662

PLASTICS

CASTOLITE Liquid Plastics. Crystal clear, colors. For casting, embedding, coating, fiberglassing; in industry, laboratories, craft work. Reproduce your designs with our mold materials. Profitable. Illustrated Catalog \$1.00. **CASTOLITE**, Dept. 808/PM, Box 391, Woodstock, IL 60090.

DO IT YOURSELF

FILES — **HOMES SHARPENING** for information send \$2.39. Files, Box 256, Ashville, New York 14710

WELDING ALUMINUM and "FOT METAL" is easy with LUMIWELD. For information — **SAFE** to Dept. HP, AluminSmiths, P.O. Box 517, Deland, Florida 32720

AMAZING TV REPAIR BOOK . . . Fix your own . . . Guaranteed. Write: Publications, Box 5178, Brea, CA 92621

PERSONAL Federal Income Tax, Condensed Instructions, Simplified Steps \$2.50. Tax Pamphlet, P.O. Box 783, Sheboygan, Wisconsin 53081

MAPLE TREE TAPS, \$1.75 each. Foote-Crafts, Box 1932, Saginaw, Michigan 48605

BUILD HYDRAULIC LOG SPLITTER! Component Sizing, Frame Drawing, Circuits, \$4.00. — CPC, Box 101-C, Marengo, Illinois 60152

NOW AVAILABLE. Ingenious Design for Bridge across your own Stream for Fishing, Fun, or Motorcycle Access, all without Wetting your Feet. Instructions, Plans, Pictures, \$5.00. Spacraft, Box 379, Stayton, Oregon 97383

MONEY. Credit Problems! Don't give up! Help Yourself, only \$10.00 will get you Step By Step Information that Works. Randy Armstrong, 6655 Gunn, Brown City, Mich. 48416

CHIMNEY Cleaning from Inside — Avoid hazardous climbing. Do-it-yourself. Brushes, fiberglass rods, accessories. Illustrated catalog \$1.00. Chimney Care, P.O. Box 426P, Cavendish, Vermont 05142

IN-GROUND Swimming Pool Kit—Blue-prints—Vinyl Liner—Slide-Walls—Skimmer—Filter—Pump—All materials Necessary for Construction—Except Local Materials—16' x 32' \$1,995.00—FOB. Cheswick Pool Sales Inc., Rte. 28, Cheswick, PA 15024. (412) 274-6400. Call Collect.

FIREPLACE and Flue Construction. How to Construct. Complete Booklet, Diagrams. \$4.95. Creations, P.O. Box 1823, Marion, N. C. 28752

UNIQUE TOYBOX. Accessible, Versatile, Simple. Plans \$1.50. S3AE, Jidimira Enterprises, 35 Warner Place, Jamestown, N.Y. 14701.

CONDO / HOME OWNERS INCREASE STORAGE! Easy to Build — Free Standing Garage Locker. Instructions, Drawings, \$5.00. Adventures, PM-1, P.O. Box 1123, Evanston, Illinois 60204

BASEMENT WATERPROOFING — Step-by-step procedures revealed for the first time by America's leading Waterproofing Expert enables you to save minimum \$1900 on normal cost for average size basement. Send only \$4.00 for 45 Page Manual to: BDS Inc., 2520 Brice Rd., Akron, OH 44313

ELECTROPLATING. Complete amateur's textbook. All metals Electroplate metallic/nonmetallic items \$9.95. Details free. Tropic, Box 95-P3, Palm Bay, Fla. 32905.

PROJECTION TV . . . Convert your TV to project 7 foot picture . . . Results equal to \$2,500 projector . . . Total cost Less than \$20.00 . . . **PLANS & LENS** \$16.00 . . . Illustrated information **FREE** . . . Macrocoma, Washington Crossing, Pennsylvania 18977

TURN YOUR IDEAS into Patents. Step by Step Procedure used by Inventor \$3.00. R.A. Smith, Box 361, Welcome, N.C. 27374

TIED of paying professional framers? You can do it yourself with the Elko Picture Frame Clamp. Clamps 4, 6, 8 sided frames. Clamps all sides simultaneously in 1 to 3 minutes. Clamps frame for stamp or frame large as twelve feet. Adjusts to any size in seconds yet fits in shirt pocket. Satisfaction guaranteed. \$13.95 postpaid. E-Z Clamp Corp., 19800 Woodpecker Road, Petersburg, Virginia 23803.

"CRAWFISH" Delicious! Build your own Trap for \$5.00. Plans \$4.00. Box 80871, Seattle, Washington 98106.

UPHOLSTERING SUPPLIES. Fabrics, Vinyls, Tools, Cane, Instruction Books, Free Catalog. Jim Dandy Sales, Box 30377P, Cincinnati, Ohio 45230.

GASOLINE ADDITIVES. Combustion/Acceleration Improver, Dry Gas, Anti-Knock, Carbon Remover. Nothing Mysterious. Common, Inexpensive Ingredients. Recipes \$3. Gas-Add, P.O. Box 1255, New Britain, CT 06050

(Continued on next page)

DO IT YOURSELF (Continued from preceding page)

TELEPHONES UNLIMITED, EQUIPMENT, SUPPLIES, ALL TYPES, REGULAR, KEYES, MODULAR. Call (714) 563-5555 or Mail \$1.00 (Refundable). Box 11478, San Diego, California 92112

GLUE! Make your own in minutes from discarded material. Strong, durable bond for wood, metal, plastic. Proven formula \$1.00. TAC, Box 241, Hemet, CA 92343

MAGNETS — Genuine Alnico Magnets — 1/4" Diameter. Hundreds of uses in Home and Shop. \$10.00 per dozen. Udico, 1557 7th Street, Santa Monica, Calif. 90401

FREE Standing Fireplace — Wood Burning. Under \$30.00. Easy instructions — 4 Hours Work. \$2.00. Fuel, P.O. Box 235, Portage, MI 49002

CUT Heating Cost with New Method. Old Crankcase Oil, inexpensive to do. Send \$3.00 for Details. Monahan & Sons, P.O. Box 5, Carmel, New York 10512

BUILD Scale Model Family Home! Plans \$7.95. Lakehurst's, Box 1956P, Wichita, Kansas 67201

COMPRESS Leaves, trash, etc. into Stove-Size logs. Plans \$4. Firewood, P.O. Box 435, Spokane, Washington 99210

POCKET BIG SAVINGS! Make your own Household Products for Pennies! Numerous formulas only \$2.00. Order today. Taylor, 2144 Coastland Ave., San Jose, CA 95125

ELIMINATE Hated TV Commercials! Forever! Install "AID". Easily. Complete Kit \$5.95. Guaranteed. Box 68431, Seattle 98168

WATERED Frames. Detailed plans \$1.95 for material list and instructions. SLEEPLAND, Box 810, Carberry, Manitoba, Canada R0K 0H0

PHOTO INVENTORY YOUR HOME AND BELONGINGS. Professional photographer's step-by-step instructions show you how. Needed in case of fire or theft. Supplies identification to police, ownership proof for insurance company. Special safekeeping album stores prints and slides. Send \$10.95 today. MC and Visa a.k. Smart Set, 225 East 17th Street, Santa Ana, CA 92706

BUILD Powerful Air Compressors From Old Lawn-mower Engines. SAVE Hundreds. Plans — \$5.00. Vandegrift, 437 Houston, Ambler, Pennsylvania 19002

REPRODUCTION MOLDS

RUBBER. Fiberglass Molds for Ornamental Concrete (Birdbaths, Planters, etc.). Over 900 to Choose From. Free information, SASE. Plycrete Mold, Elk Rapids, Michigan 49629

ARTS & CRAFTS

MAKE Figurines, Plaques, candles, lawn ornaments. Molds, plastercraft kits, liquid rubber. Sample and catalogue 25¢. Woolley Company, Box 29, Peoria, Illinois 61650.

"GETTING Started in Stained Glass" 50¢. Whittemore, Box 2065Y, Hanover, Mass. 02339.

STAINED GLASS Catalog-P Send 50¢. Tools, Supplies, Books, Saylescrafts, 171 Main Street, Nyack, New York 10960

CARTOONING, COMMERCIAL ARTS & SIGN PAINTING

LEARN Cartooning. Fun or profit. Cartooning, Box 7089G, Colorado Springs, CO. 80933

SIGN Painting Learned At Home. No Special Talent Needed. Free Proof. Watson's, Phillips, Nebraska 68865

SIGN Painting—Easy method. Free catalogue. Kaufmann Company, Centertown, Missouri 65023

MODERN Cartooning taught by mail. Write for free brochure. Cartoonrama—Box 263-2B, Branford, Conn. 06405.

35 LESSON cartooning course. Cartoonist's Magazine, both \$3.00. Hartman, Box 30367, Lincoln, Nebraska 68503.

CARTOONING, CARTOONING! Earn money now! Six different professional illustrated instruction books \$3. K. Harris, P.O. Box 1567, Portland, Oregon 97207

MODELS—CARS—SHIPS—TRAINS—PLANES ETC.

BUILD museum-quality ship models, gun models, dollhouse room settings. 1980 Model Catalog features complete kits, fittings, plans, construction materials, tools. "How-To" books. 88 pages. Only \$1.00. James Bliss & Company, Dept. PM, Route 128, Dedham, MA 02026.

MODEL AIRPLANES — Huge Catalog. \$2.00. Sig Manufacturing Co., Inc., Montezuma, IA 50171

CIVIL WAR Model CANNON Plans: Catalog free. Green—PM28, Box 892, Shelmar, Fla. 32579

RADIO CONTROL Airplanes, Boats, Motorcycles, Helicopters, Supplies, Discount Catalog — \$3.00 (Refundable). Modelers Supply, Box 7185, Montgomery, Alabama 36107

SHIP MODEL Kits, Plans, Fittings from our own Workshop. Big illustrated Catalog: \$1.00. Bluejacket Shipcrafters, 50V Water Street, South Norwalk, CT 06854

LIVE steam engine kits. Marine, stationary, walking beam. Boilers, fittings. Fascinating modeler's hobby. Catalog \$2.00. HPK, Centuck 34, Yonkers "U", New York 10710

KITES, GAMES, PUZZLES, NOVELTIES

"I'VE HAD ENOUGH CHAP-A-QUID-A-GATE". This Slogan printed on four by fifteen inch bumper sticker. Two for \$3.00 or Six for \$5.00. Order from Jones Novelty Co., RD. 3, Box 98A, Laurel, Del. 19956.

BULLSHIT - REPELLENT! Aerosol Cans — Stop Your Buddies From Telling You Those "Tail" Fishing And Hunting Tales! Only \$3.95 Postpaid. S&S Distributors, P. O. Box 10741, Dept. PM, Birmingham, Alabama 35202.

MAGIC TRICKS, JOKES, VENTRILOQUISM

VENTRILOQUISM/Puppets! Catalog \$1.00 (Refundable). Maher, Box 420PM, Littleton, Colorado 80160.

FREE! World's Leading Novelty Catalog. 1600 Jokes, Tricks, Science, Sports, Hobbies. Johnson-Smith, C-10, Mt. Clemens, Mich. 48043

FABULOUS MAGIC Catalog 50¢. Same day service, no substitutes. Fabulous Magic, 3319 E. Charleston, Las Vegas, Nevada 89104

BRAND NEW FUN CATALOG, HUNDREDS OF SUPER GIFTS, GIMMICKS, AND NOVELTIES. SEND 25¢ TO: FUN FACTORY, INC., DEPT. 1101, 41 SMITH STREET, ENGLEWOOD, N.J. 07631

VENTRILOQUISM Learned! Details .50¢. Dummies, Hariz, Box 556, Beaufort, South Carolina 29902

FREE! \$2.00 Trick, Huge Catalog, all 50¢. Abracadabra-MP, Scotch Plains, New Jersey 07076

DISAPPEARING Leprechaun, Easy Magic Catalog. \$1.00 Credit Coupon. All for \$1.00. Elliott, 212 Adelaide Street West, Toronto, Canada M5H 1W7

HOBBIES & COLLECTIONS

COLLECT Military Medals. List 50¢. Vernon, Box 387 PM, Baldwin, N.Y. 11510.

TEXAS Flintstone—Generous Sample & Prices \$3.00. Box 15392, Austin, Texas 78761

COLLECT Military Patches. Free Catalog. Emblems, 21242B-8 Hamilton, Newport News, Virginia 23602

ANTIQUES, RELICS, INDIAN GOODS & CURIOS

INDIAN Relics. List 25¢. Arrowheads \$5.00 Dozen. Folsom \$10.00 each. C. Secrist, Deerfield, Missouri 64741

OFFICIAL Guide to Antiques. 448 Pages, \$8.98. Lakewood Ltd., Box 9026-A, Reno, Nevada 89503

STAMP COLLECTING

110 World-Wide 10¢ when ordering Colorful Approvals. Jay-Lyn Stamps, Box 178-1, Chittenango, New York 13037

100 DIFFERENT Fascinating Turkey Stamps Only 25¢. (Adults Only.) Goliath, Y-1, Bethlehem, New Hampshire 03574.

PENNY! Approvals! Regardless catalogue! Kloster, 4184 52nd St., San Diego, Calif. 92105.

50 DIFFERENT Old U.S. between 1861 and 1939 - \$1.00. Ed Roush, 423 Shepard, Mansfield, Ohio 44907.

U.S. BARGAIN — 25 Different Air Mails \$1.00, with Beautiful World Wide Approvals. Stamp Center, Kennebunk, Maine 04043

BREATHTAKING Beautiful. 50 Different mint Monaco pictorials commemoratives only \$1.50 with mint complete set approvals. Pagoda, Box 132P, Sidney, Ohio 45365.

16 DIFFERENT U.S. Airmail stamps worth over \$1.00 Only 10¢. (Adults Only.) Limit One Set. Wonderful Lists Included. Littleton Stamps, AH-1, Littleton, New Hampshire 03561.

50¢ BRINGS You 100 pictorial plus worldwide approvals. Capt. Shaw's Stamps, Box 277, Ocean Park, Maine 04063.

500 DIFFERENT Stamps, \$2.00. Smith, 508A Brooks, College Station, Texas 77840.

FREE: 32 Page United States and United Nations Price List. Shelton, Box 610547C, North Miami, Florida 33161.

75 DIFFERENT US Free with Approvals. Princess City Stamps, P.O. Box 908, Mishawaka, Indiana 46544

CANADA Ten Late Commemoratives 10¢—Canadian Approvals. Harley Boardman, Little Valley, New York 14755

GREAT Gift free with 1st purchase — fine United States approval and want list service. Send .15¢ for handling. The Stamp Boutique, Box 86M, Wheeling, Ill. 60090

TOPS! 100 Popular Poland Stamps (all different) only 25¢. Mystic, Dept. P51, Camden, New York 13316.

SINGLE STAMPS 2¢ and up. Mounted in books. TRUST STAMP COMPANY, P.O. Box 100-P, Jamaica, New York 11435.

50 YEARS Old fifteen different United States, over fifty years old—25¢ with approvals. Jaxon, Box C11-P, New Rochelle, New York 10804.

FREE Worldwide packet. Penny approvals. Froelich, Box 412-A, Morton Grove, Ill. 60053.

FREE U.S. \$1.00 Stamp, Older issues, Commemoratives, Airmail, Virgin Islands, Others — Catalog Value over \$5.00. U.S. Bargain Price List. All Free! Send 10¢ for Mailing. Empire Stamp, Toronto, Ontario M4V 2M2

FREE U.S. LIST Mint Singles, Plates. Minnesota Stamp Company, Box 131, Shakopee, Minnesota 55379

220 Valuable, Beautiful, Exciting, Mysterious, International Stamps — Only 25¢ with Approvals. Stamps, PM, Box 1427, Bellflower, California 90706

FREE 100 Different with Approvals. Lawrence Stamons, 41 Kimberly Lane, Bristol, Conn. 06010

WOW!!! Free Gift!!! With Approvals. Meinhardt, Box 2205, Carbondale, Illinois 62901.

BEST in the West! We'll Prove it! Five Beautiful Sets, \$1.00. Approvals. Pioneer Stamps, Box 842, Provo, Utah 84601

CANADA. 50 different 25¢. Approvals. Oroszky, Box 1-C, Sarnia, Ontario, Canada N7T 7H8

FREE — Mammoth Collection — Scotts Master Global Albums, When you Buy Approvals. Bargain Service, Box 5345, Santa Ana, California 92704

WILL ROGERS — Olympic Games - Vietnam Veterans newest United States Commemoratives on lovely, cacheted First Day Covers. 70¢ each or all three \$2.00. K.M. Walsh, Box 308J, Tuckahoe, N.Y. 10707

FREE! 55 Different, Including Triangles, Space, Others! Request Approvals. Baird, PM-56, Box 8128, Portland, Oregon 97207

U.S. 6 Plate Blocks — \$1.00! Approvals. Gordon Davidson, Key Largo, Florida 33037

U.S. Bargains! Pre-1930 used stamps with defects. High values at great savings! Worthwhile approvals for adults only. Rivertown, Dept. 152PB, Ada, Michigan 49301.

DIFFERENT: 500 Foreign, \$1.50; 650 U.S., \$6.00; 125 U.S., \$1.00. Futrell, Spartansburg, PA. 16834

PLATE BLOCKS. Six Different 4¢ Only \$1.00. FREE WHOLESALE PRICELIST. AMPBCO, Box 26066P, St. Louis, Missouri 63136

100 Different U.S. 10¢ approvals. Bradley, Box 385P, Middletown, VA 23113

\$5.00 Value. 100 Different United States Commemoratives \$1.00: Bryson, Box 8123, Toledo, Ohio 43605

2,000,000 Stamps—150 Countries—2¢ Each. Belden, Box 4149, Dearborn 48126

FREE Surprise collection sent with approvals. Gould, 1784 Union, San Francisco 94123.

FREE! Big Bargain Catalog - New Edition listing thousands of bargains including U.S. & B.N.A. stamps, packets, albums, accessories and supplies. Also fine stamps from our approval service, buy any or none, return promptly, please. Jamestown Stamp, Dept. E20PM, Jamestown, NY 14701

1000 DIFFERENT Stamps \$3.90; 3000 \$16.70. Free Packets Catalog. Ultery, 1016 Meridian, Mishawaka, IN 46544.

WOW! 110 All Different Germany 10¢. Commemoratives, Airmails, High Values, Big Catalog, bargain lists. Also, fine stamps from our approval service, any or none, return promptly, please. Jamestown Stamp, Dept. A20PM, Jamestown, NY 14701

POPE John Paul's historical visit highlights spectacular introductory worldwide collection featuring: Lake Placid Olympics Commemorative, American Bicentennial Painting, Interplanetary Space Station, Germany Baby Animals, Anguilla United States Inverted Airplane, Friedrichshafen Zeppelin, Zaire Fish plus 100 different worldwide. Only 25¢ when requesting approvals. State age. Douglas Cook, Dept. PM-7, Las Vegas, Nev. 89119.

OLDER U.S.A. 409 Different \$20.00 Value \$3.95. Krubeck, Route Two, Mount Carroll, Illinois 61053

CLEARANCE 10 Worldwide Packets \$1.00. Collections, Box 291, Portland, Connecticut 06480

ISRAEL 15 Different 10¢ Approvals. Sam Chazen, Box 666, Delray Beach, Florida 33444

"WHOLESALE" U.S. - Foreign Pricelist and catalog Free! Everything Guaranteed. Schneider, Box 1240, Grand Rapids, Michigan 49501

WOW! Bicentennial Souvenir Sheet Worth Over \$2.00 Plus 100 Different Worldwide 25¢ With Approvals. Tarnel Philatelics, Siler City, North Carolina 27344

FREE Mongolia Camel Set. Request Approvals. Alpaugh, Box 225, Highbridge, New Jersey 08829

50 SPORTS PICTORIALS 35¢. Approvals. Arbour, 3727M Downeydale, Randallstown, MD 21133

POLAND OUTSTANDING PICTORIALS 25 Different 10¢ with Approvals. Kamco, P.O. Box 338A, Flushing, New York 11367

50 ARGENTINA — Different 10¢. Approvals. Gobestamps, Box 690, Saco, Maine 04072.

(Continued on next page)

STAMP COLLECTING

(Continued from preceding page)

BARGAIN 100 World-wide Stamps 25¢. Quality Approvals. R. Parker, Box 143, West Brookfield, MA 01585

SPECTACULAR World Collection — 10¢. Vatican Ghana, San Marino U.S., Russia, Animals, Space. Over 100 different! Plus U.S. Catalog, Approvals. Global, Box 7429-P-24, Olympia, Washington 98507

88 DIFFERENT U.S. 50¢. Pope, 230 Union Street South, Concord, North Carolina 28025. Approvals.

UNITED NATIONS 3 Complete Mint Sets 25¢. Approvals. Cornetta, POB 1509-M, Lake Placid, Florida, 33852

345 Different Stamps \$1.00. New Issues Approvals. Kiondike, Harrisburg, Illinois 62946

U.S. MINT Specialist Flag Set complete \$2.00; 1936 Army-Navy complete \$2.00. Free List. Brooks, 2601 Avenue "U", Brooklyn, New York 11229

UNITED NATIONS. Free set with price list. Placek Stamps, Box 1023, Manteca, California 95336

FIFTY Free Stamps with Approvals. J.D. Stamps, Box 747, Melbourne Beach, Florida 32951

100 INDIA 10¢. Approval Applicants. Gibson, Box T, Williamstown, New Jersey 08094

210 WORLDWIDE. Only 25¢. Including Antique Cars, Wild Animals, Unusual Issues. Approvals. Act Today! Palmour, Dept. 821, Box 1358, Pleasanton, CA 94566

SPECIAL 400 U.S. 30¢. Approvals. Wright, Box 753M, Hagerstown, Maryland 21740

FREE World Wide Stamps with Approvals. Chapmans, Box 487W, Galesburg, Michigan 49053

OLD U.S. Stamps on Approval. Chester, Box 15414G, Philadelphia, Pennsylvania 19149

GIGANTIC LIQUIDATION! 50% Discount Approvals. Gaines, Box 784-G, Mattoon, Illinois 61938

LOOK! 107 different Triangles, Sports, Topicals, etc. Only 10¢. Approvals. Jayto Stamps, Manlius, New York 13104

FREE U.S. Mint Set. Approvals. Hildebrand, Box 4867, Santa Clara, California 95054

89 DIFFERENT RUSSIA! 25¢. Approvals. Milehigh, 3445 Guilman, Denver, Colorado 80212

10¢ Stamp Assortment. Inexpensive Approvals. Lee's, Box 2105, Albany, N.Y. 12220

PENNY APPROVALS. Regardless Catalogue. Zamora, 1 Mández Uciaga, San Sebastián, Puerto Rico 00755

200 Different Worldwide — 25¢! Approvals. Boyd, Drawer 849, Saugatuck, MI 49453

WOW! 125 All different plus Mystery Gift. Only 10¢. Approvals. Fayette Stamps, Dept. 418KA, Fayetteville, NY 13066

HISTORIC Visit to U.S. of POPE JOHN PAUL II Commemorated by a Fantastically Beautiful First Time Cover with Official Postmarks and Lovely Engraved Portrait of His Holiness. Only \$1.25. K.M. WALSH, BOX 308A, TUCUMACHE, NEW YORK 10707

COINS, TOKENS, CURRENCY

3 OLD Liberty Head Nickels Only \$1.00. Issued before 1913. Limit 1 Set (Adults Only.) Plus price lists. Littleton Coins, HL-1, Littleton, New Hampshire 03561

INDIAN Cents! 7 Different — \$5.00 Postpaid. LAKEHOUSE Coins, 201 Broad, Lake Geneva, Wisconsin 53147

HONG KONG DOLLAR Only 10¢. Uncirculated cupronickel dollar. Limit One. (Adults Only.) Plus price lists. Littleton Coins, KH-1, Littleton, New Hampshire 03561

MINI-COINS. Cent Through Dollar Die Cast six-piece Set. Send \$2.50: Gregco, Inc., Box 60, Carmel, Indiana 46032

WHEAT PENNIES — 50 Different — Average Circulated \$3.00. Emporium Sales, Box 263, Arcadia, California 91006

PHOTOS & PHOTO SUPPLIES

WALLET Sized Outdoor Exposure Guide. Eliminates Meters. Five Film Speeds \$1.00. 400 Film Speed add \$1.00. RAN, 11722 Cherry, Los Alamitos, CA 90720

PAINTED Backgrounds for professional results. Photo Supplies. Two catalogs, pictures \$1.00 (refundable). Pierce, PMCO, 9801 Nicollet, Minneapolis, MN 55420

COLOR SLIDES

TRAVEL Color-Slides World-wide Catalog 60¢. Worldwide, 7427M Washburn, Minneapolis, Minnesota 55423

BOOKS & PUBLICATIONS

HOMEMAKERS! SAVE WORK-MONEY-TIME. "Helpful Homemaker Hints" in rhyme. 104 page book. IDEAL GIFT — \$2.95 plus 50¢ postage. Apple-Gems, P.O. Box 16292-P, San Francisco, Ca. 94116. Thirty Day Money-Back Guarantee.

FREE Book. Prophet Elijah Coming Before Christ. Maglido Mission, Dept. 63, 481 Thurston Road, Rochester, N.Y. 14619.

PUBLISHERS' OVERSTOCKS BARGAIN BOOKS. 3,000 titles, all subjects! Free catalog: Hamilton, 86-51 Clapboard, Danbury, CT 06810

PUBLISH Your Book! Join our successful authors. Publicity, advertising, beautiful books. All subjects invited. Send for fact-filled booklet and free manuscript report. Carlton Press, Dept. PMB, 84 Fifth Avenue, New York 10011.

OPPORTUNITIES UNLIMITED — Free Catalogs. J. Henderson, Route 1, Box 358-B, Enterprise, Alabama 36330

WILDERNESS Living! Shelter, Food, Power, Self-Defense Books. Free Catalog. Aspen Cabin, Box 2517, Flagstaff, Arizona 86003

FREE PUBLICITY FOR YOUR NEW PRODUCT! How To Get It! The Beginner's Guide To New Product Publicity. Free Details. DD Enterprises, Box 488A, Lenox Hill Station, New York, New York 10021

MILITARY Books — WWII, Korea, VN. All Branches, Catalog 50¢. Keystone Patchco, Box 2726, Philadelphia, Pennsylvania 19120

REPAIR CLOCKS AND WATCHES. Free catalog of helpful books. North American, Box 77AQA, Fox River Grove, Illinois 60021.

COMPUTER CONTROLLED Citizens; Laser Tattooing Plan — exposed! Free report. Write: Spiral, Box 80323-P, Lincoln, Nebraska 68501

CITY OF WORLD CHAMPIONS—Cookbook—Tasty Notes from Celebrities. . . Public Officials. . . Ethnic Families. . . Restaurants. . . Attractive Gift. . \$4.95—Non-Profit Organization. . TN, Box 2261, Pittsburgh, PA, 15230

SUCCEED! How-to-Guide. \$2.00. Foster, Box 975, Coronado, CA. 92118

HOW TO BUY A GUITAR. \$3.00 Gift! Giddier Enterprises, 23 Dolphin St., Regina, Sask., Canada, S4S 3J7

CASH REWARDS! OVER \$884,700.00 FOR INFORMATION ON MISSING PERSONS; PROPERTY; HEIRS. NEXT TWELVE ISSUES FOR THIS AD WITH \$10.00: REWARD NEWS HOTLINE, P. O. DRAWER 192, LIBERTY, TEXAS 77578

BOOKFINDING Librarians search worldwide titles or subjects plus 150,000 indexed stock. PAB, 2917p Atlantic, Atlantic City, N.J. 08401 (609-344-1943)

6000 News Bibles—Today's Version; Information \$1.99. Bridges, Box 4413, Hollywood, Florida 33023

RARE Old Unusual Occult Books. 900 Titles. Catalog 50¢. Marshall, Box 7169PM, Baltimore, Maryland 21218

OCULT Metaphysical, Self-Improvement Books. Free Lists. Collings, Drawer 589, Appalachia, Virginia 24216

"GIVE A Man A Fish, You Feed Him For A Day, Teach Him To Fish, You Feed Him For Life." Robert Mammen's Newest Book, THE SUCCESS IMAGE Teaches You To Fish in the River of Success, and how to Catch the Big Ones. Send \$6.00 check or money order: Ridgeview Press, Dept. PB, P.O. Box 192, Littleton, CO 80120. Money Back Guarantee.

SUCCESS! Money! How to sell yourself (ideas, products). \$4.95 guide. Office Dynamics, 1612 Shield, Laramie, Wyoming 82070

PLAYS, SONGS, MANUSCRIPTS

POEMS, SONGS: Your Song or poem may earn you money. Free Examination. Columbine Records, 6430 Sunset Blvd., Suite 1221, Dept. PM, Hollywood, California 90028

MUSIC INSTRUCTIONS & INSTRUMENTS

MUSICAL EAR! Play Easy Tunes on Violin in 2 Weeks. New Technique. Send \$12.00 for Course. Broadview, 76 Norwood, Plainfield, New Jersey 07060.

INTERNATIONAL Catalog valuable to makers, repairers of stringed instruments. Imported woods, parts, accessories, kits. Fine German-made violins, violas, cellos, basses and bows. Send 25¢ for catalog. Credit certificate worth \$1.25 enclosed with catalog. International Violin Company, Dept. AE, 4026 W. Belvedere Ave., Baltimore, Md. 21215.

ACCORDIONS — Famous Makes. 40 Models! Importer-to-You Prices. Save! Cordovox and Button Style. Home Trial. Trade-ins. Terms. Free Catalog! Accordion Corporation, Dept.R, 5535 Belmont, Chicago 60641

PIANOS, PLAYERS, PUMP ORGANS. Rebuild and repair. Catalog of "How-To" books. \$2.00 (refundable). Vestal Press, Vestal 11, New York 13850.

ACCORDION Top Brands, Cordovox, Buy Direct. Tremendous discounts. Trades accepted. Free brochure PM. Accordion-O-Rama, 15 West 19th Street, New York, N.Y. 10011.

SUPER-SAVINGS Guitar Strings, Accessories, Effects Pedals, Microphones, etc. Free Catalog. Super-Save Music, Box 387, Boca Raton, Florida 33432

POEMS Set To Music. Nashville Music Productions, Box 40001-PM, Nashville, Tennessee 37204.

EASY PLAY Dulcimers, from \$66.00. **EASY** MAKE KITS, from \$27.00. Mandolins, Banjos, Whistles, more; catalog. HERE, Inc., #P. 29 SE Main St., Minneapolis, Minnesota 55414

BANJO, GUITAR Cassette Lessons. Free Catalog. Bailey, 4005PM Lara, Chattanooga, TN 37416

STRINGS, ACCESSORIES, SCARCE PARTS, REPAIR BOOKS. Catalog 25¢. Stringking, Rifton, New York 12471

HARMONICA KIT. Learn to play the harmonica in just one evening. Kit includes harmonica and instruction book featuring over 35 popular songs. Send \$3.98. T.S. Magillie, 3411 Carlton, Amarillo, Texas 79109

P.M.I. — 1986 MUSICAL INSTRUMENT CATALOG — \$2.00 — Credited on 1st Purchase America's most complete source of major brands instruments and accessories at Low, Low, Prices. Write: P.M.I., Dept. PM, P.O. Box 827, Union City, N.J. 07087

ELECTRIFY Player Pianos, Pump Organs Quickly. Inexpensively with Lee Silent Suction Units. Write: Lee Music, P.O. Box 308F, Culver, Oregon 97734

GUITAR HOME STUDY COURSE. UNIQUE. ACCLAIMED BY 100,000 STUDENTS WORLDWIDE. WRITE FOR BROCHURE: MAIC, BOX 38122, WASHINGTON, D.C. 20016

IMPRINTED GUITAR PICKS For sample of 18 different picks & prices, send \$1.50 to: Sound & Stage, P.O. Box 34, Fanwood, NJ 07023

FREE Catalog. Build harpsichord, harp, hammered dulcimer or Appalachian, banjo, mandolin. Also completed. HDC, 4419 West Colfax, PM, Denver, Colorado 80204

EDUCATION & INSTRUCTIONS

WELDING TRAINING. Basic and Advanced for Major Processes - Arc (Stick), MIG, TIG, Gas Pipe all processes. A non-profit school. Accredited member NATTS. Approved Ohio 70-12-0064 HT. Write for school bulletin and course schedule. **NOBART SCHOOL OF WELDING TECHNOLOGY**, Box 80, Troy, OH 45373.

BETTER ENGLISH Can increase career opportunities. Improve your grammar in 12 hours. Easy, effective, unusual method. Box 5532, Evansville, Indiana 47715

COLEMAN CAMP GEAR Repair. Earn as you learn at home for profit or hobby. Lanterns, Stoves, heaters, all models. Modern Schools, Dept. PM, 4225 N. Brown Ave., Scottsdale, AZ 85251.

UNIVERSITY DEGREES BY MAIL Programs! Bachelors, Masters, Ph.D's . . . Free revealing details. Counseling, Box 317-PM2, Tuslin, California 92680.

SCREEN - Printing. Learn how to make money at home spare time printing signs, bumper stickers, T-shirts, more. Print on paper, plastic, glass, metal, fabric . . . for stores, retailers, mail order, factories, politicians, etc. Write: Screen Printing Center, 4401 Birch, Dept. PBCC9, Newport Beach, CA 92660

HIGH SCHOOL At home, no classes. Diploma awarded, low cost. Information FREE, call toll free anytime 1-800-621-5809 (Illinois 800-972-5858) or write: American School, Dept. 30245, 850 E. 58th St., Chicago, Illinois 60637

DETECTIVE Profession. Easy home study; free tielack or lapel pin, certificate future. Professional Investigators Training School, Dept. CP, P.O. Box 1890, San Pedro, CA 90733

INSTANT MEMORY . . . NEW WAY TO REMEMBER. No memorization. Release "photographic" memory. Forget nothing! Liberates extraordinary knowledge, talents, ESP, immediate results! free information. Institute of Advanced Thinking, 845PM ViaLapaz, Pacific Palisades, California 90272.

BARTENDING - Bar Management Home Study. Bartending Training. 3843-C San Fernando Road, Glendale, CA 91204

VETERINARY Assistant — Train at home for exciting animal care career. Send for Free "Career Kit." North American School of Animal Sciences, Dept. PBCC9, Newport Beach, CA 92660.

REISCH WORLD WIDE COLLEGE OF AUCTIONEERING, INC. - Worlds Largest 46 years. Term soon. Free catalog. VA Approved. Modern Auction Library "FREE" with enrollment. 515-423-5242 — Col. Gordon E. Taylor, P.O. Box 949, Dept. 19, Mason City, IA 50401.

EXTENSION And Post-Graduate Awards in Philosophy, Art, Science, Botanic, Medicine, Homeopathy, Radionics and others. 30 subjects Curricular free (airmail \$1.00 refundable). Registrar, Sussex College of Technology, Highfield, Danehill, Sussex, England.

AUTOSUGGESTION. Sleep-learning headquarters! Tapes, records, books. Gigantic catalog free. Research Association, Box 24PM, Olympia, Washington 98501.

LEARN Law Enforcement, Patrol procedures, criminal investigation, making arrests and more. Course includes scientific kits — fingerprinting, crime photography, evidence collection. Free facts. Police Sciences Institute, Dept. PBCC9, 4401 Birch, Newport Beach, CA 92660.

LEARN Sewing Machine repairing. A profitable Trade. Easy to learn. Free details. Sewing Center, 187 FR, Rochelle, GA 31079

AUCTIONEERING - Free catalog. Resident or Home Study Course. Nashville Auction School, Nashville, TN. Mailing address - P.O. Box 190, Lawrenceburg, TN 38464.

HOW Your MIND CONTROLS HEALTH! Easy method sheds stress! American Meditation, 1232 Race Road, Baltimore, Maryland 21237

(Continued on next page)

EDUCATION & INSTRUCTIONS (Continued from preceding page)

CUSTOMIZE Vans, Exteriors, Interiors. Learn at home in spare time. GI/VA Approval. Free Facts. Customizing Center, Dept. PBCC9, Newport Beach, CA 92660.

FASCINATING FINGERPRINTS. Learn how to take, identify, classify, photograph fingerprints. And much more. Over 200 Pages with Hundreds of Photographs. Money-back Guarantee. Only \$10.00 to: Globe Enterprise, P.O. Box 1085, Glen Burnie, Maryland 21061

FREE NEWSLETTER! Powerful, easily-stimulated brain hormones increase brainpower instantly! Guaranteed! EDEPS, 600 Hunter's Trail, 23C, Glendora, Ca. 91740.

RADIESTHESIA, Radionics, Dowsing E.S.P. Courses and Equipment Illustrated Catalog \$1.00 (refundable) Established 27 years. Dept. PM/R Bruce Copen, Highfield, Donenhil, Sussex, England RH17 7EX.

EARN HIGH SCHOOL DIPLOMA AT HOME FAST!!

STATE Registered. Lowest Tuition Available. Individual Counseling. Credits Awarded for Job Experience and previous Courses. Free School Ring. Call Free 1-800-327-8103. Cambridge Academy (PM-2), 409 East Osceola, Stuart, Florida 33494

BOOKKEEPING Or Accounting! Easy home-study plan prepares you quickly to do your own books . . . or others. Approved for Veterans. Free "Accounting Career Kit." Write: Accounting School, Dept. PBCC9, Newport Beach, CA 92660.

AUCTIONEERING BID CALLING — Cassette tape by experienced auctioneer and instructor. Send \$24.95 to: Vince Simmons, P.O. Box 67, Lakeland, Florida 33802

LEARN Asleep or awake. Records, tapes, equipment! Free catalog! Drawer PM-400, Ruidoso, New Mexico 88345

AUCTIONEERING: Mendenhall School of Auctioneering, High Point, North Carolina 27263. Free information.

ELABOROUS Radio Announcing, my 25 Years Experience may Help You. Send \$3.95 to: RADIO BOOKLET, Dept. P, P.O. Box 1565, Indianapolis, Indiana 46206.

PRIVATE INVESTIGATION CAREER! Free details! Shaw Investigation, Box 716, Provo, Utah 84601

PIANO TUNING PAYS. Learned easily at home. Accredited NMSC, GI Approved. NILES BRYANT SCHOOLS, INC., Dept. P, 3631 Stockton, Sacramento, California 95820

USED Courses! Books! Lists 25¢. Smith's, 124 Marlborough, Salem, Massachusetts 01970

TRAVEL Agent/Tour Guide! Home-study plan explains exciting Travel Careers, how to qualify for Travel Benefits. Approved for Veterans. Free Brochure. Travel School, Dept. PBC10, Newport Beach, CA, 92660

BE A BARTENDER Professional Home Study Course. College of Cocktails, Box 35132-M, Los Angeles, Calif. 90035.

UNIVERSITY DEGREES BY MAIL . . . OUR SPECIALTY. FREE Revealing details. Success, Box 13151-M2, Columbus, Ohio 43213.

LEARN GAS TURBINES! Correspondence course covering all systems, maintenance, theory, operation. Established 1957. Valuable diploma awarded. American Jet School, Department 105B, Darby, Montana 59629

INFORMATIVE CHARTS — Engineering Constants, Measures, Weights, Belts, Pumps, Hydraulics \$2.00. Standards, Box 5303, Statesville, North Carolina 28677

DRAFTING — Blueprint Reading (Mechanical, Electronic, Architectural). Home Courses \$25.00. Send \$2.00 first lesson. Prior, Inc., 23-09 169 Street, Whitestone, New York 11357

BASIC REAL ESTATE Guide. Terms, Hints, Explanations. \$3 for Broker, Box 363, Fort Atkinson, Wisconsin 53538

BE A RADIO ANNOUNCER! Former Radio Program Director Tells How To Get Started — Where To Get Training. Send \$2.00. Gatehouse Publications, Box 65, Proctor, West Virginia 26055

EMPLOYMENT INFORMATION

JOBS OVERSEAS . . . (INCLUDING ALASKA) Free Details, Wages, Countries, How To Apply. Globalemploy, Box 808, National City, California 92050

A-U-S-T-N-A-L-I-A . . . H-E-W-Z-E-A-L-A-N-D WANTS YOU!! — 17,800 JOBS!! — PAID TRANSPORTATION!! — NEW REPORT!! — \$2 — MONEYBACK GUARANTEE!! — "AUSTRALIA COMMISSION," DEPARTMENT 884-12, NATIONAL PRESS BUILDING, WASHINGTON, DC 20045

JOURNEYMAN LEGITIMATE CREDENTIALS GRANTED! Write: National Craftsmen Union, 210 Fifth Avenue, Suite 1102, New York, NY 10010

1980s' HOTTEST CAREERS! Guide \$2.00. Knowhow, Box 261-PM2, Monroe, North Carolina 28110.

REMO GROWING Like Crazy! Jobs Galore! Several Pages Classified, \$1.00 Greenback. Crampton, 905 West Center, Fallon, Nevada 89406.

JOBS! HOW TO GET THEM! Professional Guidelines for Resume Writing, Interviews, Job Hunting. \$2.00. Success, Box 15185, Fort Wayne, Indiana 46815.

CASINO Dealers Make Big Money; Become One. Simple Method. \$3.00. Sunny, Box 5786D, Reno, Nevada 89513.

EXCELLENT BILFELD OPPORTUNITIES, EXCELLENT PAY Onshore and Offshore. Opportunities Unlimited in all 50 states and the three coasts that surround them. For information and employer addresses send \$7.00 to: MKT Services, P.O. Box 14006, Fort Worth, Texas 76117

ROCKY MOUNTAIN EMPLOYMENT NEWSLETTER!! Colorado, Idaho, Montana, Wyoming!! Current Openings — All Occupational! Free Details Intermountain-L, 3506 Birch, Cheyenne, Wyoming 82001.

JOB HUNTING? "How-To"—Complete Guide. FREE Details. Jim Glunt Publications, Box 299, Dept. PM, Bedford, PA 15522

WORK FOR A WEEK IN WAIKIKI. Or Anywhere you Wish! Exciting Job Exchange — Vacation Plan Program. Hundreds of Jobs Available! For Complete Information Send Name, Address, Occupation and \$5.00. National Employment Services, 1100 Quail St., Suite 200, Newport Beach, CA 92660

OFFSHORE JOBS Unskilled \$330.00—\$450.00 per week skilled much higher. Complete Information \$5.00. Oushore Jobs, Box 378M, Mary Esther, FL 32569

JOBS! Direct Mail Approach. Avoid Competition Of Published Market! Low Cost!! Northeast USA. Roger, Box 612-B, St. Johnsbury, VT 05819

AUSTRALIA - NEW ZEALAND Want You! 75,000 jobs. All occupations. Big pay. Free transportation. Employer listings \$2.00. Plus information 68 other countries. Ausico, Box 4116E, Hayward, CA. 94540.

AUSTRALIA-NEW ZEALAND Need You! 55,000+ Positions. Free Passage. Job Listings \$2.00. Jobco, Box 4055, Fullerton 92631.

JOBS—JOBS—JOBS! ALL TYPES AVAILABLE IN TEXAS. LOWEST UNEMPLOYMENT Rate in the NATION. Send \$2.00 for CLASSIFIED SECTION of SUNDAY NEWS-PAPER. Specify Dailies, Fort Worth, Houston or San Antonio. AAKTON, Dept. 501, Box 28439, Dallas, Texas 75228

STUDY and Work Opportunities Abroad. Send \$2. for Catalog and Instructions. Student-Travel, Box 21064, Seattle, WA 98111

EMPLOYMENT WANTED

ARE YOU LOOKING FOR EMPLOYMENT? Try our Classified Section! It costs only \$4.00 per word. And, if you wish to run all or part of your ad in bold capital letters, you can do so for as little as \$1.00 per word additional. Act now! Send your ad to: **POPULAR MECHANICS, CLASSIFIED DEPT., 224 WEST 37TH STREET, NEW YORK, NY 10019**

HELP WANTED

TEXAS REFINERY CORP. offers PLENTY OF MONEY plus cash bonuses, fringe benefits to mature individual in your area. Regardless of experience, write: W. D. Pate, Pres., Texas Refinery Corp., Box 711, Fort Worth, Texas 76101

PARTTIME Place work. Webster, America's foremost dictionary company needs home workers to update local mailing lists. All ages, experience unnecessary. Send name, address, phone number to: Webster, 175 Fifth Ave., Suite 1101-1303-B, New York, N.Y. 10010

OVERSEAS Employment . . . \$10,000-\$50,000 +. Free information! Employment International, Box 29217-AB, Indianapolis, Indiana 46229.

FOR INVENTORS

INVENTORS Patent Your Invention. Free Initial Consultation. We are Registered by the U.S. Government. Victor J. Evans & Co., 4637 Eastern Ave. N.E., Washington, D.C. 20018. Since 1898.

WRITE: Crane & Associates, Consultants, 819 E. El Camino, Box 834, Santa Maria, CA. 93456

INVENTORS PROTECT INVENTION with documentary Record of Invention Kit, instructions, samples how to record and protect your idea. Patent information. \$3.95 plus 75¢ postage. Jack C. Wright, 57 Lindbergh Blvd., Bloomfield, N.J. 07003

U.S. PATENT Office Searches, 234 Broadway, Room 3615, New York 10007. Free invention certificates.

INVENTORS — United States Patent Office Searches. Patent Development Engineering and Marketing of your inventions, ideas with manufacturers contracts. Send for FREE INVENTION CERTIFICATES and Invention information. Serving Inventors Since 1948. **GEORGE SPECTOR, LICENSED PROFESSIONAL PATENT ENGINEER.** Former UNITED STATES PATENT OFFICE EXAMINER—3615 Woolworth Building, New York, 10007

NONPROFIT Foundation helps inventors. Widest range of services. Free recording forms. Free evaluation. Affiliated Inventors' Foundation, 501-B Iowa, Colorado Springs, Co. 80909.

PATENT AND DEVELOP Your Invention. Registered Patent Agent and Licensed Professional Engineer. Send for FREE PATENT INFORMATION Every Inventor Should Have. Richard L. Miller, 3612 Woolworth Building, New York, New York 10007 (212) 267-5232

REGISTERED PATENT ATTORNEY. Applications and Searches. Mail Service. Free Preliminary Review. Box 392, Millwood, N.Y. 10546

INVENTORS: If you have an invention for sale or license, write for free booklet explaining how we can help you. Kessler Sales Corp., C-52-F1, Fremont, Ohio 43420

PATENT ATTORNEY Serves Inventors by Mail. Box 405, Medford, Massachusetts 02052

REGISTERED PATENT ATTORNEY Washington D.C. Suburb. Donald A. Kettistrings, 414 Hungerford Drive, Suite 411, Rockville, Maryland 20850

PATENT Applications at Reasonable Rates. Edwin Uren, Registered Patent Agent, 430 Kelvin Court, Spring Hill, Florida 33526.

NEW! "Patenting Your Invention Yourself!" \$29.95. Moneyback Guarantee! Registered Patent Attorney, 7400PM Benjamin Franklin Sta., Washington, DC 20044

PROTECT Your Invention. Registered Patent Attorney. Many Years Experience, all Fields. Individual Inventor's Problems Given Special Consideration. Very Reasonable Charges. Write for Free Information. Paul H. Gallagher, 105 W. Adams, Chicago, Illinois 60603

WAIVER & ASSOCIATES, INC. Will Draw, Describe, and Submit your Product/Idea to 100 Manufacturers within Four Months. Write: Box 313, Lake Bluff, Illinois 60044

INVENTIONS WANTED

INVENTIONS MARKETED! Cash, Royalties! FREE INVENTION PROTECTION CERTIFICATES. George Spector Manufacturers Representatives, Woolworth Building, New York, N.Y. 10007.

IDEAS, inventions, new products needed by innovative manufacturers. Marketing assistance available to individuals, tinkers, universities, companies with feasible concepts. Write for: KIT-PM, IMI, 701 Smithfield, Pittsburgh, PA 15222.

INVENTIONS WANTED. FREE CONSULTATION. NO IDEA TOO SMALL. Disclosure protection. Cash or royalties from manufacturers seeking new ideas. For free information on how to protect your ideas, Call or Write: **AMERICAN INVENTORS CORP.,** 59 Interstate Dr., Dept. PM, West Springfield, MA 01089. (413)737-5376. A Fee Based Service Company.

LEARN How to offer your invention for sale or license. Free booklet outlines procedures, royalty rates, requirements. Kessler Sales Corporation, C-52-IW, Fremont, Ohio 43420

REAL ESTATE & FARMS

FREE! Big Spring Catalog! Over 5,400 country properties described, pictured! Land, Farms, Homes, Businesses, Recreation, Retirement buys! Selected best thruout the U.S. Over 700 offices, 43 states! All Across America! Yours FREE from the World's Largest! **STROUT REALTY, Inc.,** 7 S. Dearborn, Dept. 5800, Chicago, IL 60603.

CANADIAN LAND FROM \$47.00 AN ACRE. Low monthly payments. Choice properties across Canada. Ideal for cottages, hunting, fishing & investment. 6 month money back guarantee. 12 month exchange privilege. Catalogue \$1.00 Write: Canadian Estate Land, Dept. 23C, 286 Lawrence Ave. West, Toronto, Canada M5M 3A8

OPTION Your Way To Wealth. Send \$10.00 (Refundable — 60 Days). Option-P, P.O. Box 2308, Melbourne, Florida 32901

CALIFORNIA. Acreage. Lots. \$30 down. \$30 monthly. Box 35291, Los Angeles 90035

BIG . . . FREE . . . SPRING CATALOG! Over 2,700 top values coast to coast! **UNITED FARM AGENCY,** 612-PM West 47th, Kansas City, Mo. 64112

OVER 1500 Properties in the South Central Ozarks, Mild Climate, Low Taxes, Productive Long Grazing Season. Free Brochure. Graven Realty, Inc., 120PM West Second, Mountain Grove, Missouri 65711. (417) 926-4206.

42,000,000 ACRES Valuable Government land available low as \$3.50 per acre. Campsites, farms, homesites. Fabulous business opportunities. Latest report! Send \$2.00. Satisfaction Guaranteed. American Land Disposal, Box 730-A, Holland, Michigan 49423.

10-20 ACRES in fabulous Northern IDAHO. Choice land in beautiful timbered settings. In the heart of lake, hunting & recreation country. Reasonably priced. Terms. Parcels with domestic water and power available. A unique opportunity for country living at its best. Write for free information: **NATIONAL ASSOCIATED PROPERTIES,** Dept. GC, 1121 Sherman, Coeur d'Alene, ID 83814 (208/664-8161)

RECREATION Land Tracts. 5-40 Acres. Idaho — Washington — Montana. Timber — Views — Streams. Insured title — Access — Low down. Write: Western High Lands, Inc., Dept. A, Box 969, Hayden Lake, Idaho 83835

HOW TO FIND AND PURCHASE GOOD COUNTRY LAND. Send \$2.50 — Free Bonus Offer Now! S&S Investments, P.O.Box 10741, Dept. PM, Birmingham, Alabama 35202

HISTORIC Western Town in beautiful Southern Utah. Hunt, fish, camp yearround. Huge valley rimmed by mountains. Lots \$895 full price, \$10 down. Complete information \$1.00. Southwest, Box 37 (N), Beryl, Utah 84714

SAVE Thousands! Sell your own Home. FREE Details. E2 Home, 53 Park Place, New York, New York 10007

BEAUTIFUL Small Waterfront Lot \$5.00 — Ideal Gift. John Jackson, Jr., 680 Muscogee Dr., A3, N. Ft. Myers, Fla. 33903

EXPORT—IMPORT

"DISTRIBUTE Products From Manufacturers Worldwide." Free Brochure! Ballico, Box 9130982, Cleveland, Ohio 44101

BUY IT WHOLESALE

IMPORTS Closeouts Liquidations
Job Lots, 500,000 Products! Rock-Bottom prices!
Free Sample! Insiders, Box 879, New Hyde Park,
N.Y. 11040

BELTS And Buckles. Complete line fast sellers
including truckers, motorcycles, CB's, westerns, etc.
Big Profits. Complete dealer set up. Catalog, details
free. Anchor Specialties, Box 3958-BPM, North
Providence, RI 02911

REPLACEMENT PARTS, Service tools for Chain
Saws, Small Engines. First Quality. Substantial
savings. Free Catalog. Stores, shops, give sales tax
number for dealer information. Repair Parts, Box
6329-K77, Erie, PA 16512

SAVE ON PARTS! Free catalog jammed with Motor-
cycle, Snowmobile, Small engine parts, Accessories.
Manufacturer's Supply, Box 157-PM, Dorchester,
Wisconsin 54425

AMERICAN Jewelry Manufacturer in Thailand!
GUARANTEED Gold and Silver Jewelry with
GENUINE Rubies, Sapphires. Low **WHOLESALE**
Prices. No U.S. Customs Charges. Catalog \$3 Re-
funded with Purchase. Gems Unlimited, 158/14
Soi Pramote, Bangkok, Thailand, 5

HAVE Own Business. World's largest wholesalers.
American, foreign. Bargains. Free details.
International Buyers, Box 16386-M, Portland, Oregon
97216

RINGS, Jewelry priced 130% below Retail Price.
Catalog, \$1.00 (Refundable). Anka-PM, 95
Washington, West Warwick, RI 02893

WORLDWIDE Wholesale Bargains! Imports
Closeouts Dropship Marnees, 9225PM
Parkway, Highland, Indiana 46322

400,000 BARGAINS Below Wholesale. Many Free!
Liquidations Closeouts Job Lots
Single Samples. Free Details. Bargainhunters
Opportunities, Box 730-A, Holland, Michigan 49423.

HEARING Aids, Batteries. Wholesale. Catalog 25¢.
Fiston, Box 1444, New Preston, Conn. 06777

FREE CATALOG. Indian Jewelry Wholesale.
Manufacturer, Box 27230-P, El Paso, Texas 79926

CLOSEOUTS! Discounts! Below Wholesale! Free-
bies! Samples! DDN, Box 20152 PM, Ferndale,
Michigan 48220.

WHOLESALE Guide: Office Supplies . . . Printing . .
Envelopes . . . Jewelry (African, Indian) . . . Candy . .
Gifts . . . Records, Tapes . . . Etc . . \$3.00. Information,
Box 3913-AB, Springfield Massachusetts 01101

JEWELRY Luggage. Gifts at Discounts Up to 40%.
Wholesale Catalog—\$3.00. Aspro, Box 407-P, New
York, New York 10038

ADV. AGENCIES, ADV. SERVICES, MAILING LISTS

EXPERT Assistance for mailorder, advertisers.
Ratebook leading newspapers, magazines \$1.00.
Chicago Advertising Agency, 28-EM Jackson, Chicago
60604

MAILORDER ADVERTISERS! CLASSIFIED ADVERTISING
CAN BE MOST PROFITABLE AND REWARDING.
PROBLEM IS TO KNOW WHAT TO DO. WHAT NOT TO
DO. COLUMBIA CAN HELP YOU WITH YOUR MAIL-
ORDER PROGRAM. OVER 20 YEARS CLASSIFIED
ADVERTISING EXPERIENCE. KNOWLEDGE OF BEST
PULLING PUBLICATIONS. EXPERT COPY SERVICE IS
ALL YOURS AT NO INCREASE OVER PUBLISHER'S
STANDARD RATES. CHANCES ARE YOU WILL SAVE
MONEY. WRITE TODAY FOR FREE DETAILS PLUS YOUR
FREE COPY OF "MAILORDER ADVERTISER'S RATE
GUIDE". COLUMBIA ADVERTISING AGENCY, BOX 1289-
PM2, RICHMOND, INDIANA 47374

BUSINESS SERVICES

HOW TO START AND OPERATE A SMALL BUSINESS.
Complete guide to management, sample forms, copy-
righted, \$5.00. Baker & Associates, Inc., Dept.-P,
P.O. Box 524, Newport, Oregon 97365

RUBBER STAMPS

RUBBER Stamps. Free Catalog. Jackson's,
Brownsville Rd., G-101, Mt. Vernon, IL 62864

PERSONALIZED Pocket Rubber Stamp. 3 lines
\$2.75; Bett-R Enterprises, 12100 Valley Spring Lane,
#308-P, Studio City, California 91604

UNIQUE Plastic Stamp your Return Address on 3
Lines and Stamp Pad \$6.00 postpaid. Dixie, Box
202, Jackson, Mississippi 39205

OFFICE SUPPLIES

PROFITS FROM CLASSIFIED ADVERTISING! Booklet
shows you how to start your own business with
Classified Advertising. Only \$1.00 (Refundable with
first order.) H. E. KAPPEL, POPULAR MECHANICS,
DEPT. P, 224 WEST 87TH STREET, NEW YORK, N.Y.
10019.

PRINTING PRESSES— RUBBER STAMP OUTFITS

SIMPLE-X RUBBER STAMP PRESSES. Hydraulic
operated electrically heated. Sizes 5" x 8", 8" x
12", 10" x 15". Starting outfits. Order for presses,
supplies shipped day received. Send \$2.00 for
Catalog and Brochure. Custom Manufacturers, Box
211-PM, Springfield, MO 65801.

TYPE Fonts, Hand Printing Presses, Supplies. 120
pages, \$1.00 deductible first order. Acme Type, 732
Federal, Chicago 60605.

COMPLETE Rubber Stamp Outfits, Supplies. Same
day shipment. Sign Engraving Machines. Wholesale
Catalog \$1.00 Deductible. Star Stamp, 732 S.
Federal, Chicago 60605

PRINTING Presses, type. Supplies Lists, 20¢.
Turnbaugh Service, Mechanicsburg, Pennsylvania
17055

PRINT YOUR OWN — Printing presses, type,
supplies direct from factory. Send 25¢ for catalog
and samples to: Kelsey Co., DM, Meriden, Conn.
06450.

RUBBER Stamp supplies catalog. Jackson,
Brownsville Rd., S-110, Mt. Vernon, IL 62864

WHOLESALE Rubber Stamp Outfits, Supplies. Cata-
log \$1.00. Martine, 1432 Major, Jefferson City, MO
65101

PRINTING & SUPPLIES

QUICK Copy Printing. Low Prices. Write:
Nationwide, 614 North Main, Bloomington, Illinois
61701

PRINTING — Stamp Cuts Made. DeLouise, Box
106, Islip Terrace, NY 11752

GUMMED LABELS

1,000 DELUXE PERSONALIZED GOLD STRIPE
GUMMED Address labels. Prompt delivery. \$2.00
Postpaid. Jamada International, P.O. Box 161,
Brooklyn, N.Y. 11230

1,000 Deluxe Gummed Address Labels \$2.00. Free
Literature. Acme, 55 Tomoka, Pittsburgh,
Pennsylvania 15229

GIFT SHOPPING

EXCITING Gift Catalog. B&W Enterprises, 1389B
Munro Avenue, Campbell, California 95008

TALKING EXECUTIVE TEDDY BEAR. Pull the String
and the Bear says, "You Are A Born Leader. You Are
On Your Way To The Top. There Is Nothing You Can't
Do. You Are A Winner". P.J.'s Enterprise, 2345
Woodbridge, Dept. 117, Roseville, Mn. 55113

FREE CATALOG! Unusual Gifts for all Ages! Novak,
Box 1516-MC, Troy, Michigan 48069

CLOCKS, WATCHES, OLD GOLD, JEWELRY

HIGHEST CASH for Gold, Jewelry, Gold Teeth,
Rings, Diamonds, Watches, Silver, Platinum, Mail
Articles Today. Free gift with information. Chicago
Gold & Precious Metals, 6 E. Monroe, Dept. 658,
Chicago, 60603.

HIGHEST CASH IMMEDIATELY For old gold, silver,
platinum, jewelry, gold teeth, watches, diamonds,
spectacles. Free information. Rose Industries, 29-A
East Madison, Chicago 60602. Established 1934.

GOLD-SILVER-PLATINUM WANTED. For free infor-
mation Write: Wilimots, 345 S. Glassell, Orange, Ca.
92664

WATCH And Clock repairing books, tools, ma-
terials. Free Catalogs. North American, Box 77-AO,
Fox River Grove, Illinois 60021.

DIGITAL WATCH REPAIR — \$19.99 — All Makes
and Models — LCD, LED, 90 Day Warranty. Act Now
for Free Battery Replacement — Module Replace-
ment Extra. Digitronics, P.O. Box 643PM, Old Bridge,
New Jersey 08857

CLOCKS Handcrafted Wood Brochure \$1. Fisk, 631
Union, Middletown, New Jersey 08846

GOLD

FIND GOLD — Guide tells how. Free information.
David Hunt, Roosevelt, Utah 84066

WEEKEND GOLD, Looseleaf book, **PLANS**, \$10.00.
J. Bruun, 1275 Terry, Idaho Falls, ID 83401

GOLD — — **STRIKE IT RICH! HOW TO EXTRACT**
GOLD FROM OCEAN, RIVER, LAKE OR BAY WATER!
Not a Gimmick — — But a **SIMPLE Scientific**
PROCESS. Order U.S. Patented Plans Showing How.
Send \$11.95 To: D & D Enterprises Inc., P.O. Box
32934, Dept. M2, San Jose, California 95152. Avoid
the Rush. **ORDER NOW!** 1980C, D & D Enterprises
Inc.

PRECIOUS STONES & MINERALS

GET Free catalog no serious rockhound, gem
Cutter, jewelry maker, hobbyist or craftsman can
be without. Full of bargains, exclusive items, low
prices from largest suppliers and authorities in the
field. Free new catalog just off the press, yours for
the asking. Write: Grieger's, Dept. C-12, 900 South
Arroyo Pkwy., Pasadena, California 91109

FREE Indian Necklace. SASE. Walton Wholesale,
201 1/2 5th Street, Fowler, Indiana 47944

800 POLISHED Gemstones \$5.00. Tumblecraft,
5401 James North, Minneapolis, Minn. 55430.

TREASURE FINDERS

TREASURE - Locate quarter mile away with ultra
sensitive locator - brochure free. Research Products,
Box 13441 - AMC, Tampa, Florida 33611

FIND Lost coins, jewelry, buried treasure, gold
nuggets, relics. New revolutionary patented detector
analyzes objects, tremendous range, no ground pick-
up. Free catalog. Gardinar, 4729M N. 7th Ave.,
Phoenix, Arizona 85013

REDUCES PRICES! Manufacturing Overage Topline
Metal Detectors, Contact D-TEX, 614 Easy Street,
Garland, Texas 75042

PROFITABLE OCCUPATIONS

AMAZING! \$265,000 Yearly with classified ads.
Free Proof. (Stamp Appreciated). Moneycraft, PM-2,
2316 Dale, Ceres, Ca. 95307.

INSPECT House Structure and Systems for Buyers.
Operate from Home. High Hourly Return. Free De-
tails. GNHI, Box 115, Orleans, Mass. 02653

PLASTERCRAFT!!! Profitable home business. Molds
available. Details: Lynnette, 6251C Mentor Park,
Mentor, Ohio 44060

RENTAL AGENT Prestigious profitable home busi-
ness. Complete guidelines \$3.00. Relief, P.O. Box
32248, Minneapolis, MN 55432

FT. SMITH Auction School, Ft. Smith, Ark. 72901.
Resident & Home study. Veteran Approved.

MAKE MONEY IN SPARE TIME. Earn generous com-
missions as a subscription sales representative for
leading magazines. For full details and instructions,
send this ad with your name and address to:
POPULAR MECHANICS, Dept. AB-M, 250 W. 55th St.,
New York, NY 10019

FREE Catalogs. Repair air conditioning. Refrigera-
tion. Tools, supplies, full instructions. Doolin, 2016
Canton, Dallas, Texas 75201.

SALESMEN—DISTRIBUTORS

MAKE EXTRA MONEY DURING YOUR SPARE TIME!
Show our New Line of Calendars, Pens and Popular
Advertising Gifts to Local Firms. Prompt, Friendly
service from small town AAA-1 Company in our 71st
year. No investment or collection. Weekly com-
missions. Be your own Boss. Full Time potential. No
Experience Necessary. Write: Richard Lowe, **NEWTON**
MFG., CO., Dept. PMC2, Newton, Iowa 50208

SELL SENSATIONAL LOW-COST BURGALAR ALARM.
Lightening seller. Exceptional margin. Samples for
trial. Northwest Electric, Ave. 2113, Mitchell, South
Dakota 57301

AGENTS WANTED

MAKE Big Money selling to friends and neighbors.
No investment! No Risk! Instant cash. Free Catalog
and Selling Kit. Mason Shoes, K-525, Chippewa
Falls, WI 54729.

PRINTING Advertising Salesman—Excellent money
making sideline selling Decalcomania Name Plates,
small quantities. Advertising Specialties, sign
letters. Free samples. Raico XL, Boston, Mass.
02119.

SPARE TIME CASH. Sell famous Hanover Shoes.
Samples, sales kit free. No experience needed. No
age limit. Big commissions. Hanover Shoe, Dept.
2603, Hanover, Pa. 17331.

SPARE TIME CASH - Show Brand New 50-Page Sign
Catalog and Samples to Local Businessmen. Write
orders. Collect Deposit, we do rest. Details: Signco,
17715 W. McNichols, Detroit, MI 48235

BUSINESS OPPORTUNITIES

IMPORT-Export opportunity, profitable world-wide,
mail order business from home, without capital.
We ship plan for no risk examination. Experience
unnecessary. Free Report. Matlinger, Dept. C2702,
Woodland Hills, California 91367

MAILORDER Opportunity! Start Profitable Home
Business without Experience or Capital. Write for
Free Book, Case Histories, Plus Complete Details.
No Obligation. Mail Order Associates, Dept. 507,
Montvale, NJ 07645

ABANDONED INDUSTRIAL SILVER—take it! Details:
Metals, Box 548, Woodville, Texas 75979

BECOME A WHOLESALE! RB Enterprises, 4555
Carmen, Chicago, Illinois 60630

MAKE BIG MONEY - up to \$29.00 an HOUR. Send
\$4.95 for Complete Course and Manual, to: Frank's
Steak House, P.O. Box 703, Niagara Falls, New
York 14302.

BUSINESS Opportunity Newsletter. Professional
Advice. Extra Income. Argonaut, Box 1688-PM2,
Springfield, Ohio, 45501

FREE POLISHED REDWOOD BURL GIFT. 25¢ postage,
packaging. RB, Dept. 12, 4829 Bal Alre, Arcata,
Calif. 95521

HOW To Sell Books by Mail — \$5.95. Phillips
Co., 1873 Plaza, (Suite 1301), Garland, Texas 75041

TAKE Catalog orders. We drop-ship 2,500 best-
selling specialty products. Lowest below wholesale
prices. Immediate delivery. Spectacular home
business opportunity. Free book. SMC, 6061 De Soto
Ave., Dept. 20-86, Woodland Hills, Ca 91365.

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

MAKE BIG MONEY By Selling What You Know. \$10.00. Fowler, Box 137-B, Lake Dallas, Texas 75065

TURN THOUGHTS INTO CASH! Write Short Newspaper Paragraphs. Easy! FREE Details. O'Dell, 3131-K Stanwood, Philadelphia, Pa. 19138.

"ADS 'M' ANSWERS" has current 'Business Opportunities' classified answers. We answered 'em all for you. Send long, self addressed stamped envelope. Consumer Assistance Corp., 'The Consumer's Watchdog', Box 13102, St. Petersburg, Florida 33733

PROFESSIONAL BUSINESS START-UP MANUALS. Prepared by Leading Financial Institution. Used by Business Investors, Banks, Etc. Magnus, 6201-M2 Hartford Road, Baltimore, MD 21214

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising Only \$1.00 (Refundable with first order.) M. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

COST REDUCTION FOR SMALL BUSINESSES. Engineer Shows how to save Thousands. \$5.00 — BRL Systems, 1409 Carriage Lane, Westmont, Illinois 60559

A FANTASTIC business!!! \$9.95. Anyone can do it!!! Free details!!! Turner, Box 2971, Spokane, Wa. 99220.

BE YOUR OWN BOSS! Free Details. Mallorder, P.O. Box 1804, Manassas, Virginia 22110

BIG Earnings!! Steady Income!! Proven Mallorder Business. Free Profit Details. Garrison, 650 Wagner, Greenville, OH 45331.

BUMPER STICKER PRINTING DEVICE. Cheap, Simple, Portable. Free details. Bumper, POB 22791 (GS), Tampa, Florida 33622

300% Profit Possible Selling Gift Items. Novelties, Toys! Minimum investment! Full Profit Details. Hughes Giftworld, Box 9016PM, Newark, New Jersey 07104.

MAKE Durable Building Plastic Easily Waterproof. Fireproof, Economical. Bays Laboratory, 2086 — 2075 Drive, Cedaredge, CO 81413.

PREPARE Tax Returns. — Policeman Albert Myers made \$2,000 his very first season. Train at home. N.Y. Approved. National Tax School, Monsey, 28M, N.Y. 10952

NEW TAX LOOPHOLES DISCOVERED. Everyone Eligible. Free Facts. ULC, Box 3598L, Clarkston, GA 30021

PICTURE Framing—Profitable full or spare-time business. Easy to learn with handbook-course "Guide To Picture Framing Profits." \$3.00 Guaranteed. Free framing-supplies catalog included. Japs, 125-PM Seventh North, Hopkins, Minnesota 55343.

VENDING Machines. No selling. Routes earn amazing profits. Big catalogue Free. Parkway Machine Corporation, 1930PMB Greenspring Drive, Timonium, Maryland 21093.

REPAIR HYDRAULIC JACKS — DETAILS FREE. WRITE: HYDRAULIC PARTS SUPPLY, BOX 4187, BROWNSVILLE, TEXAS 77820.

KNAS DEBTS with little known law — CREATE Wealth!! Details FREE! Blueprints, #B2, Box 100, LaGrangeville, N.Y. 12540

BET RICH!! Secret Law smashes Debts — brings Cash and Credit. Details Free! WealthKit, Box 350-B, Billings, New York 12510

WOODWORKERS — Start Profitable Business making Unusual Gifts, Decorative Novelties. Easy!!! Everything explained!!! Free details. Williams, 32P Titus, Glen Cove, NY 11542

MAILORDER \$1,000.00 POSSIBLE MONTHLY Selling Information. Free Details. AR Enterprises, Box 92-2, Bronx, New York 10465

LEARN The secrets of repairing junk batteries "Fabulous Profits" small investment. Apex Engineering, 5454 Boisa, Alascadero, Calif. 93422

JEWELRY SALES CAN MAKE YOU RICH! Full or spare time. Starter kit \$1.00 (Refundable). Nasco, 310-AOB Lincoln Avenue, Fox River Grove, Illinois 60021.

VINYL'S Where the money is! Professionally repair, refinish, recolor furniture, luggage, car tops. Quick, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a few days practice. Sensational details free. VIP, 2007 Montrose, Chicago 60618.

\$700 Per month earnings possible filling out income tax forms at home or tax office during tax season. We show you how. Simple, quickly learned. Details mailed free. No salesmen. Hurry. Big demand. Federated Tax, 2065 Montrose, Chicago 60618.

"MAILORDER Laws and Regulations" explains necessary licenses, different taxes etc. \$3.00. Wonderful dropship proposition free. Neil N. Tasker, Shamokin, Pennsylvania 17872

ASSEMBLE PRODUCTS AT HOME. Many opportunities paying High Weekly Profits presently available without investment. Write: Businesses, 92-82 Brighton 11th, Brooklyn, New York 11235.

PHOTOSTAMP Agents Wanted! Make big Money From Home mailorder. Free Samples, Information. Postermatic-C7, East Providence, R.I. 02914.

MAKE \$15.00 hourly building custom luggage/cases at home. Huge nationwide demand. Fill mail orders. We supply materials, instructions... everything. Free details. Customcase, 6075 De Soto Ave., Dept. X20-85, Woodland Hills, CA. 91385.

PIANO Tuning quickly learned with home study courses. Diploma granted. American Tuning School, 17050 Teifer Drive, Morgan Hill, Calif. 95037.

AMAZING! \$265,000 Yearly with classified ads. Free Proof (Stamp Appreciated). Moneycraft, PM-2, 2316 Dale, Ceres, Ca. 95307

HOT — Stamp Prints Gold Leaf. Personalize everything. Print Business Cards, Pencils, Matches. Free Details. Gold Magic, POB 24986 (GC), Tampa, Florida 33623

\$500 WEEKLY GROOMING Dogs! Your Home... Anyone Can Learn. Free Details!! Winewood, Box 322PM, Waupaca, Wisconsin 54981

BUSINESS Opportunities Clearinghouse, the magazine for ideas, contacts, and free ads. Writer: BOC, Box 538, Morton Grove, Ill. 60053

BIG Profits in becoming a supplier to major industry through electroplating small parts and metalizing non-metals. Write for free particulars: Mason, Room MC-2-JA, 1512 Jarvis, Chicago, IL 60626.

MAKE 200%-300% on hundreds of products. Gift items, novelties, toys, carded merchandise, 1001 others. Giant Catalog \$2.00 (refundable). JAL Enterprises, Box 7021A, Los Angeles, CA 90022

SURPRISE EVERYBODY. Become Notary Public now. We guide you, free. We sell notary needs. Raise your image, job value, income. Assistance nationwide. Brochure: Gulf, 234 Club-A, San Antonio, Texas 78201

\$38.90 DAILY PAY. \$388.88 WEEKLY. Homework. Immediate Income. Earnings Guarantee Certificate. Free Report/Application. AAHP, Unit 29309-F, Madcansta, Texas 78229

A GUIDE TO STARTING IN MAIL ORDER — \$1.00 Refundable. CTB, Box 15585, Fort Wayne, Indiana 46885

"OBTAIN Capital" Become Broker! Profitable. (Booklet \$2.00). Financial, Box 99PM2, Uleta, Florida 33164

MAKE 2 to 3 times your cost! Gifts, Novelties, 1001 Others. Giant catalog \$3.00 (refundable). Wholesalers, Box 15784-M2, Austin, Texas 78761

ASSEMBLE Wood Lamps for Cash. Long SALE. Multiserv, Box 164M, Lincoln, Massachusetts 01773

PROFITABLE BUSINESS due to PETROLEUM SHORTAGE. Send \$8.00 for Details. D.P.D. Enterprises, P. O. Box 89 Auburn, Alabama 36830

LEARN HOW YOU can take less than \$50.00 and turn it into HUNDREDS every week. No gimmicks or tricks, unique. \$3.95. Box 2324, Garland, Texas 75041

PHOTO LAB Agents wanted! We Develop Anything — Discreetly. Send for Free Information. API, Box 4815-P, Philadelphia, Pennsylvania 19124

BE YOUR OWN BOSS!! "999" Easy. Spare Time. Proven Home Businesses. Write: MJT, 7545 Edison, Tucson, Arizona 85715

SCRAP SOLD YOUR WAY RICH. Amazingly Simple. Details \$1.00. Kenlines, Box 14281, Savannah, Georgia 31406

MAKE Big Profits on Hundreds of Products. \$2.00 brings Giant Catalog (Refundable). Earl Phelps Company, 19016 Lanbury Ave., Cleveland, Ohio 44122

"999 SUCCESSFUL Little Known Businesses". Information, write: D. Baskin, 3066-D, Glendale Ct., Decatur, Georgia 30032

FREE Inflation-Beater Book "2042 Unique Proven Enterprises." Fabulous "Little Knowns." Work home! HAYLINES-B, Carlsbad, Calif. 92008.

PIANO Tuning Learned Quickly at Home! Free Information. Empire School, Box 450327, Miami 33145

SELL Books By Mail. Complete Dealer Set-up — 25¢. Midwest, Box 44-R2PM, Shawano, Wisconsin 54106.

MAILORDER Profit Newsletter — Professional Advice, Advertising Recommendations. Free Report. Communications, Box 405PM, Boston, Mass. 02199.

SYNTHETIC LUBRICANTS. Dealers wanted. Unlimited earnings. Free exciting details. Cresbrite, 6026-F Waggoner, Dallas, Texas 75230

WE PAY \$1 EACH PHOTO done! \$12.50 hr. Easy! Write FREE Report, #PM-2, 3110 Fulton, Sacramento, CA 95821

SELL Books By Mail. Jones, Box 24484, Vancouver, B.C., Canada V5T 4E1

GET Something to Sell? Do it Through the Mail — the Most Inexpensive Way. Free Details. Send #10 SASE. Plante Co., 143 1/2 N. Market, Paxton, IL 60957.

INSURANCE — Be an Agent — See Auto — Homeowners. Free Details. Mr. Agent, POB 60205, Nashville, Tennessee 37206

UNLIMITED Profits Possible! Sell Exquisite Jewelry. Large Selection. Full Color Catalog — \$2.00 (Refundable). McCloud Enterprises, 96 Arcade, Calumet City, IL 60409

BECOME REAL ESTATE INSPECTOR — \$100.00 HOUR-ly Potential. Be Boss. Part/Full Time. Home Operation. Eliminates Investment. Simplified Instruction, Forms, Assistance. Free Information. IOREI, Box 418-M6, Sullivan, MO 63080.

CONSULTING Business! \$100.00 Plus/Hour Possible! Establish your Own. Easy! No Need To Be Expert. Complete Instructions. Guidance. Write Today! Free Details. ICOA, Dept. CH-2, 563 West Westfield Blvd., Indianapolis, IN 46206.

BIG Money. Monument Sales. Free Details. Box 846, St. Cloud, MN 56301

START Profitable Service Business—Easy! Alena, Box "A", Farmingville, New York 11738

I MADE \$40,000 Year by Mailorder! Helped others make money! Details 25¢. Torrey, Box 318YY, Ypsilanti, Michigan 48197.

BOOMING Book Business! Amazing 300% Profit. Dealer Packet Free! Mitchell, Box 1058PM-N, Benton, AR. 72015

AMAZING Profit! Wholesale Merchandise. No investment. James Cline Co., Uniontown, Kentucky 42461

FREE Jewelry Sales Kit. Make 233% Profit. Courtney Gems, 1634 Bogart, Bronx, New York 10462

FREE Giant Catalog — business plans — reveal how to become wealthy wholesaler — from home full/spare time — Carwai, 6009-PMQ20 Hillcrest, Tacoma, Washington 98499

MAIL ORDER Riches Revealed... Learn to sell books "Lazy Boys" way... Fantastic Formula!! Free Details: Elan Publications, Box 7025, Dept. PM-1, Tulsa, Oklahoma 74105.

SELL Oil Portrait Painting From Photos. Dealer-ship \$1.00 (Refundable). Merlin-PM28, 86 Valmonte, Banning, CA 92220.

I MADE \$1 Million finding capitol for local merchants & businessmen. Helped others start.. No selling. Write: FBA-12, Kerrville, Texas 78028

CHIMNEY SWEEPING is a High Paying Trade! Become a Professional CHIMNEY SWEEPER Quickly and Economically. Free Information. Michael James Chimney Sweeping, Box 1078, Dept. PM, Aptos, California 95005

MAKE \$2,000.00 MONTHLY. Spare time. Unique proven enterprises. No Selling. No Capital to start. Free brochure. Kashiholder, Box 1132-19K Indianapolis, Indiana 46225.

\$82.00 From Square Foot Plywood. (Huge Demand). Revealing Proof 25¢ (Refundable). Woodwin, Bridgewater, Mass. 02324

REPAIR HYDRAULIC AND PNEUMATIC JACKS — — — and Power Tools earn Big Money. Short Course \$3.95. Auto Jack, Box 10301, Orlando, Florida 32809

LEARN Sewing Machine Repairing. Men. Women. Lucrative Profits. Grasslin Correspondence School, Box 927, Spencer, Iowa 51301.

\$480 Weekly. Home mailing program. Goodworld, Box 26233-N, Tamarac, Florida 33320

WOODWORKERS — Turn \$4 material into \$34.95. Free Brochure! Fine Shop, 78P, West Petersborough, New Hampshire 03468

RESTAURANT RECIPES BUILD SALES. START A RESTAURANT. PROFESSIONAL, TESTED, PROVEN RESTAURANT SIZED RECIPES FOR TODAY'S "IN" FOODS. FREE INFORMATION. Creative Food and Restaurant Consultants, Box 62, Wilmette, Illinois 60091

EARN UNLIMITED Extra Income Taking Catalog Orders. Unique Import Items. Free Details! World's Best Inc., 8047A Caminito De Piza, San Diego, California 92108

\$250.00 Weekly Guaranteed. Work 2 Hours Daily at Home (\$178.00 for One Hour). Free Brochure. R.C., P.O. Box 534, Saint Joseph, Missouri 64501

VENDING Machine Profits: Begin Home. Authoritative Manual Instructs. Details, Free Directory Machine Manufacturers. Clifco, Drawer 7519PM2, Alexandria, Virginia 22307

FANTASTIC Way to Start your own Import-Export Business from your Own Home Without Investing in Merchandise. World Traders Digest and Directory of Foreign Suppliers. Reveals U.S. Governments Help. Report \$5.00. Write: Can-Am Enterprises, Dept. P.M., 464 Bruce Avenue, P.O. Box 970, Nanaimo, B.C., Canada

FREE Mailorder Dropship Business Journal! Mailer's World, Box 1395K, Sioux Falls, South Dakota 57101.

999 Low Capital Businesses. Free Details. Horn, 542 Seneca, Dept. 280PM, Aurora, Illinois 60506

FREE Details on High Profit Mail Order Book Business. Vantage, Box 224-PM, Hyde Park, Mass. 02136

MANUFACTURER NEEDS MAN To Assemble product at home and supply national sales crews, full or part time. Should desire business of their own. Five-figure income potential. S.K.R.M. Manufacturers, River Bend Plantation, Broadway, North Carolina 27505

\$2,000.00 Monthly Possibility! Over 2,100 Items Available. Huge Profits Every Sale! Free Brochures. Derst Company, 629-P2 Mosby, Savannah, Georgia 31405

MAKE MONEY AT HOME: Many Profitable Programs. Rush \$1. and SASE. Shukr, Box 174-PM Ahuntic, Montreal, Quebec, Canada H3L 3N7

(Continued on next page)

BUSINESS OPPORTUNITIES

(Continued from preceding page)

26 UNUSUAL Ways Mechanically Inclined People Make **EXTRA CASH!** Free Details. Write: Entrepreneur, 2311 Pontious Ave., Suite B-416, Los Angeles, CA 90064

EXPLOSIVE! Dynamic! Breakthrough! New Hand-capping Angle! First Time Revealed! Be One Of The Fortunate Ones! Jump On The Band Wagon! Seize This Lucrative Opportunity Now! Rewards Unlimited! Wager \$10.00 On This One! No Ripoff! Lifetime Opportunity! Box 19166, Cleveland, Ohio 44108

"HOW To Pick A Successful Home Business Venture", \$2.00. REN, 24 Hillsdale, Scott Depot, West Virginia 25560

ASTOUNDING Money-making, Recession-proof Mail-order Business! Exciting Details. Cummins, Box 20683, San Diego, California 92120.

MAILORDER: FREE DROPSHIP DIRECTORY. Clifco, Box 7519pm2, Alexandria, Virginia 22307

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

MAILORDER MILLIONS. Expert Reveals Proven, How to Method For Success. Free Details. S. Enterprises, 508 Maple Street, San Mateo, California 94402

BUSINESS Loans! Repay from profits. 98% Accepted! Associates, Box 98-A3, Brooklyn, NY 11235

816 Profits Striping Parking Lots. Huge Demand! Start without investment. \$816, 473 Morris, Providence, Rhode Island 02906

BUSINESS Ideas. Self-improvement Newsletter. Details. Impressions, 6569 Main, Williamsville, NY 14221

PROFITABLE Mailorder Plans. Kenmar, PM, Box 15266, Fort Wayne, Indiana 46815

FREE Brochure "Starts" \$100.00 Daily Marketing Program! Balco, Box 91309P2, Cleveland, Ohio 44101

WHOLESALE Opportunity. Hundreds of Items. Fast Sellers. Information. Shurlaine, 1939P Guernsey, Beaverton, MI 48612

GUARANTEED \$238.00 Weekly. Homework! Earnings Guaranteed. SIA, Box 182PM, Quilman, Texas 75783

WORK At home. Let us help you begin your mailorder business. Personal assistance. Details \$1.00. Home Business Opportunities, Box 283, Clarington, Ohio 43915

MAKE Thousands in Mail Order. Free Details. Coto, 3351 Hull Avenue, Williamsbridge, New York 10467

BECOME YOUR OWN BOSS — Home Improvements Information \$10.00 — Resume. Contractors Training of Illinois, Box 21, 101 E. Healey, Champaign, Illinois 61820

\$100/DAY TABLETOP ELECTRIC FACTORY Earns Big Profits! Knowledge, investment unnecessary. Prospects \$3.00 (Refundable). Sweett, Box 591, Titusville, Florida 32780

MONEYMAKING OPPORTUNITIES

HOW TO WIN CONTESTS! Send \$2.95 Postpaid — Free Surprise — Bonus if You Order Now! S&S Investments, P.O. Box 10741, Dept. PM, Birmingham, Alabama 35202

DEALERS Wanted. Large Profits. Unique Proven Business. Argonaut, Box 1688-2MP, Springfield, Ohio 45501

FIRST TIME OPPORTUNITY Start Business for less than \$200.00. No Competition yet! For information Send \$5.00 to Series 1, P.O. Box 32, Rocheport, Missouri 65279

MAKE Statuettes, Novelties, Imitation Marble. Sell to stores or start gift shop. Details 25¢. Marbleizing, P.O. Box 117B, Baldwin, Missouri 63011

"HOW to Become Rich Subconsciously. Biblically Oriented." \$10.00. Global Publications, Box 32186, Minneapolis, Minnesota 55432

OVER 1,000 BUSINESS-OF-YOUR-OWN opportunities in 5 issues of Opportunity Magazine and they're yours free for the asking! Writer Opportunity, Dept. 467, 5 N. Michigan, Chicago 60602.

DOLLARS FOR YOUR JUNK. Junk Dealers Secrets Revealed \$3.00. Tesar's, Box 73, Christmas, Florida 32709

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

\$480.00 WEEKLY POSSIBLE! Unique Mail-Order Opportunity. "Guaranteed Program." Interested? FREE Details: Freedom, Box 30224-PP, Denver, Colorado 80230

DEALERS wanted - full or part time - new product, details, sample \$3.00. Puglisi Enterprises, Box 4507, Manchester, N.H. 03108

INSTANT Win. Now available first instant prize \$million Lottery. Free details and membership: Canadian Money Club, Dept. PM, P.O. Box 1006, (Adelaide Stn.), Toronto, Canada M5C 2K4

CASH Loans "Overnight." Wipe out Debts! Enjoy AAA-1 Credit! Free Report. "Research," Box 29263-AB, Indianapolis, IN 46229.

VINYL'S Where The Money Is! Professionally repair, refinish, recolor furniture, luggage, car tops. Quick, easy. Two small \$20 jobs a day earn you \$1,000 a month. Homes, cars, offices, restaurants, unlimited customers. Start earning after a few days practice. Sensational details Free. VIP, 2062 Montrose, Chicago 60618.

SWEEPSTAKES — Contests - Crosswords! 60-page sample Free! Prizewinner-P, Box 10596, St. Petersburg, Fla. 33733.

PROFIT From Inflation, Guaranteed Results. Report \$2.00. Midwest Consultants, Box 733, Rochester, Indiana 46975

HOW INFLATION CAN MAKE YOU RICH NOW! Send \$3.50 Postpaid: S&S Investments, P. O. Box 10741, Dept. PM, Birmingham, Alabama 35202

LET Me show you how you can have your own Rubber Stamp Business Free! Write: Roberts, Room RC-2-JA, 1512 Jarvis, Chicago, IL 60626.

SELL PHOTOS — Make money with your camera. Booklet tells how. Includes directory of where to sell your pictures. Your camera could provide a second income. Only \$1.50. A. Hansen, 500 Park Drive, Box 116, Bellmawr, N.J. 08031

\$48.85 Daily Starting next week. No Mailorder Swindle or Stuffing Envelopes Ripoff! For Information Mail 20¢ Poststamp: Sblamek, Drawer 4099, Valley Village, CA 91607

STOP Wasting Money answering questionable opportunity ads. 1000 offers explained. Globe, Box 20588-PM, St. Louis, Mo. 63139

FREE Report. New Discovery in Battery Reconditioning Means "Big Profits Fast." Electone, 7415 Gable Drive, Little Rock, Arkansas 72205

GAMBLERS — FREE! WIN lifetime income from dice, roulette, thoroughbred, harness, dog racing. Guaranteed! Research, Box 551PM43, Mineola, NY 11501

CLIPPING NEWSPAPERS — Earn \$150 weekly at home. Free Details! Box 1626, Waterbury, Connecticut 06721

MAKE MONEY! Collect GOLD and SILVER coins. Booklet tells how. Send \$2.00 Val-Lue Enterprises, Dept. 102M, 1923 19th Lane, Brooklyn, NY 11214

101 PRACTICAL Ways to Make Money at Home. Details free. Fugate Enterprises, 1312 Lindell, PM, Hannibal, MO 63401

HOW To Make Money Writing Short Fillets. Report \$1.50. Easy Mailer's, Box 9803-2PM, St. Thomas, V.I. 00801

FREE Details! Proven Money Making Mail Order System. Money Minder's, 295 Mobil, Suite 3, Camarillo, CA 93010

WIN at Roulette! Winners' System. Winning Almost Guaranteed Instruction Booklet \$2.00. Plante, 1434 1/2 North Market, Paxton, IL 60957.

APPRAISING Real Estate. Fantastic Profits. Free Report. AAR, Box 6125 PM, Hayward, CA 94544

WE BUY NEWSPAPER CLIPPINGS of Wedding Announcements for \$1.00 each. Instructions \$1.00. Clippings, Box 491-PM, Gatesville, Texas 76728.

MONEY! MAKING IT! ... WINNING IT! Write: KNOWHOW, Box 261, Monroe, North Carolina 28110

TABLES Using Free Construction Scraps. Attractive, Sturdy, Quickly Built. Complete Instructions. \$2.00 to: Basics, Box 1766, Dillon, Colorado 80435

MAKE Money Selling Photos. Instructions \$2.00. 135 Walter Avenue, Thornwood, New York 10594

MAILORDER BEGINNERS. \$50,000 Yearly Potential! Sell Information. At Home, Part Time. Free Brochure. Alpha Omega Enterprises, 416A Jeffries, Monrovia, CA 91016

SUCCESS BOOKS RENTED! Inexpensive Opportunities. Wholesale Gift! Gee's, 288 N. Livingston, Livingston, NJ 07039

FREE List of Money-making Booklets. Ideal Specialties, 673-A Grove St., Rahway, N.J. 07065

HAVE FUN AND MAKE MONEY TOO! WIN MONEY AT THE RACE TRACK, POKER, BLACKJACK, AND DICE. Amaze your Friends at BILLIARDS. Send Now for FREE Catalog of Information That Tells You How!! YOU CAN BE A WINNER! Shaw, 7217 University, E8, Peoria, IL 61614

NEW - Proven Plan For The 1980's - "JOIN IT" - Extra Money For You. Satisfaction Guaranteed. Send \$10.00 Today. Mardou, 1307 PM, Laurelton Drive, Endicott, NY 13760.

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

END Money worries forever! I made \$77,000 last year. Paid Hardly any taxes. You can too. Free proof! Sterne, 8361-M Vickers, San Diego, California 92111

MAKE MONEY FROM HOME! Start your own profitable business! Free Details! Patrick's, 912 Summit, Downers Grove, Ill. 60515

50 MONEY-MAKING REPORTS YOU CAN REPRINT, SELL FOR 100% PROFIT. GROVE BOOK COMPANY, PM280, 8519 HAZEN STREET, HOUSTON, TEXAS 77036.

INCREASE YOUR INCOME \$350.00 Weekly Home Business. Free Details. G-K Enterprises, P.O. Box 1097-B, Cleveland, Texas 77327

\$200,000 Possible Immediately from Government Oil and Gas Leases. Details \$1.00. Energy Resource Company, 1013 Westchester Court, Evansville, Indiana 47710

RABBITS—CHINCHILLAS—FUR BEARING ANIMALS

AMAZING Profits! \$10,000 Yearly Raising Rabbits for Wool and Breeding. Details—\$1.00. American Angora, Malta 12, Montana 59538.

\$500-\$1000 Month Plan raising Rabbits for us. Free details. White's Rabbitry, PM, Hudson, Ohio 44236.

EARTHWORMS, LIVE BAIT

FREE Literature Profitable Business Raising Fishworms, Crickets. We Teach you how to Raise and Sell. Write today. Carter Fishworms, Plains, Georgia 31780.

GREY Nightcrawlers — Raise/Retail — Free Literature. Fair's Earthworms, Edison, Georgia 31746

REDWORMS Bedrun 5,000-\$22.00; 20,000-\$57.00 including postage. Raising Instructions. Brazos Worm Farms, P.O. Box 4185PM, Waco, Texas 76705

POULTRY & GAME BIRDS

BIG FREE CATALOG, all about growing birds at home, incubators, feeders, hatching eggs. Write: Marsh Farms, 14272 Brookhurst, Garden Grove, CA 92643

QUAIL And equipment catalog. Also booklet "How to Produce and Sell Quail Year Around". Send 25¢ to: GOF Mfg., P.O. Box 1552, Dept. 1552-L, Savannah, Ga 31402

899 Picture Color Catalog \$1.00. "Everything—You Name It!" Swans, Peacocks, Bantams, Pigeons, hobby supplier. Stromberg's Pats Unlimited, Pine River 59, Minnesota 56474

OF INTEREST TO ALL

RID Fleas, Roaches and other Household Pests yourself. Eliminate Costly Pest Control Agencies. Product Information \$2.95. — Preferred Products, 414 Woodward Avenue, Jacksonville, Alabama 36265

DIAMONDS—DO IT RIGHT — By a simple test learn to Tell the Difference between genuine Diamonds and Simulated ones. Send \$2.95 to: Helpful Hints, P.O. Box 8672, Orlando, Florida 32806

FREE FIREWOOD, Plus get PAID! Complete Details, \$2.00. J. Lord, 641 Belair, Augusta, GA 30907

SAVE Hundreds Buying From The Manufacturers. For Details Send Stamped Envelope: Wrench Publications, P.O. Box 4277, San Leandro, California 94579

HOW TO PREPARE OWN SIMPLE WILL - Instructions, Samples - \$10.00. Willis, Box 42, Sedan, Kansas 67361

STOP OVERPAYING YOUR FEDERAL INCOME TAX! Easy to Read Report Prepared by Professionals. Money Back Guarantee. Send \$3.95 to: TAXES, P.O. Box 1654, Corpus Christi, Texas 78403

SHORT Time Only. Gather Coins Double Face Value, Last Chance, Now, \$5.00. Rudys, 901 Lawndale, Royal Oak, Michigan 48067

HOTTEST NEW COLLECTIBLE - RARE GEMS! Details Free! Taylor's, 113PM Martin, Indian Harbor Beach, FL 32937

BURGLARIES ARE SKYROCKETING! Your House, Apartment or Farm May Be Inviting A Theft! Complete Manual of Home Security. \$4.00. Glenvale, Box 358p Station D, Toronto, Ontario M6P 3J9

SNOW REMOVAL MADE EASY! FREE BROCHURE. McLean's, Box 562, Statesville, North Carolina 28677

FREE FUELS! Guide to obtaining 7 heating fuels absolutely free! \$2.95. SAVE, Box 810, Carberry, Manitoba, Canada R0K 0H0

SELF Improvement Books, Free Catalog. Shaw, 7217 University, Peoria, Illinois 61614

PRODUCE YOUR OWN GAS From Beans! Entertaining Details \$2.00 SASE, Expressway, Box 6339, Ventura, California 93003

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

OF INTEREST TO WOMEN

STUDIO Home Knitting Machines are a profitable hobby. Credit available. Send \$1, for information to Studio, Box PM46017, Seattle, WA 98146.

GOVERNMENT SURPLUS

GOVERNMENT LANDS FROM \$7.50 ACRE! Homesites, farming, vacationing, investment opportunities! "Government Land Buyer's Guide" plus current listings—\$2.00. Surplus Lands, Box 19107-AB, Washington, D.C. 20036.

(Continued on next page)

GOVERNMENT SURPLUS

(Continued from preceding page)

"GOVERNMENT SURPLUS DIRECTORY" . . . Buy 500,000 items (including Jeeps) . . . low at 2¢ on dollar! Most complete information available — \$2.00 (guaranteed). **SURPLUS DISPOSAL**, Box 19107-AB, WASHINGTON, DC 20036.

1980 Surplus Army, Navy store 64 page illustrated catalog. Send \$1.00. Ruvel, 3037 North Clark, Dept. J-2, Chicago, Ill. 60657

J-E-E-P-S — \$10.30! — C-A-R-S — \$13.50! — 850,000 ITEMS — GOVERNMENT SURPLUS — MOST COMPREHENSIVE DIRECTORY AVAILABLE TELLS HOW, WHERE TO BUY — YOUR AREA — \$2 — MONEY-BACK GUARANTEE — "GOVERNMENT INFORMATION SERVICES," DEPARTMENT B-2, BOX 99249, SAN FRANCISCO, CALIFORNIA 94109.

D-F-F-I-C-I-A-L UNITED STATES DIRECTORY . . . Jeeps . . . \$37.22!! . . . 400,000 Listings!! . . . Your Immediate Area!! . . . UNEQUALLED!! . . . \$2.00 (INCLUDES G-LANDS, G-LOTTERIES INFO-GUIDE!!) UNCONDITIONALLY GUARANTEED!! . . . United States/Great Lakes Federal Surplus Depository, 6-807-PJ, Marshfield, Wisconsin 54449. (COPYRIGHT 1980)

JEEPS \$80.00 — Send for Directory Today, \$1.50. MONEYBACK GUARANTEE. Jeeps, Dept. PM2, R. 1, Box 8, Hoschton, Georgia 30548

GOVERNMENT SURPLUS. Buy your area. How, Where. Send \$2.00. **SURPLUS HEADQUARTERS BUILDING**, Box 30177PM, Washington, DC 20014

J-E-E-P-S!! \$33.30!! 525,000 Items! Buy in Your Area! How! Where! — "Moneyback G-U-A-R-A-N-T-E-E-D 1980 Government S-U-R-P-L-U-S Directory" — Including: "Buy G-LANDS," — "G-O-I/Gas L-O-T-T-E-R-I-E-S," — \$2.00. **GSURPLUS**, Box 2009E, Syracuse, New York 13220.

HOW to Make Money on Government Surplus. Send \$1.75. Bob Rees Products, R.D.#1, Emporium, Pa. 15834.

MOTORCYCLES — JEeps — HELICOPTERS — AUTOMOBILES . . . GOVERNMENT SURPLUS DIRECTORY—MONEYBACK GUARANTEE— How, where—\$2.00. GS information, Department 12, Federal Building, Box 3913, Springfield, Massachusetts 01101

JEeps, Trucks, from \$52.40 . . . Boats, Airplanes, Automobiles, Motorcycles, Typewriters, Tools, Clothing, Sports, Camping, Photographic, Electronic Equipment . . . 300,000 Amazing Bargains direct from Government Nationwide . . . low as 2¢ on dollar! Surplus Catalog and Sales Directory \$2.00 (refundable). Surplus, Box 954-PPM, Muskegon, Mich. 49443

DISCOUNT Catalog — Viet-nam Boots, Canteens, Viet-nam Jackets, Knives, Jungle Hats, Packs, Helmets, C-Rations. Send \$1.00 Refundable. Dixie Military Surplus, Box 8149-PM, Nashville, Tennessee 37207

JEeps \$52.40, Airplanes \$75.01, Typewriters \$6.70, Boats \$7.50, direct from government. Directory and Surplus Catalog \$1.00 (refundable). Midwest Surplus, Box 401-PM, Dayton, Ohio 45401

B-A-R-G-A-I-N-S !!! Jeeps—4WD Trucks—Tractors! —Typewriters!—Tarpas! —Government Sales, Your Area —E-X-P-E-R-I-E-N-C-E-D —B-U-Y-E-R-S Guaranteed R-E-P-E-R-T, \$2.—TJB, Box 157-P, Vernon Hills, Illinois 60061

PROFIT FROM GOVERNMENT SURPLUS \$3.00. **SURPLUS REPORT**, Box 7067, Cleveland, Ohio 44128

GOVERNMENT Surplus Directory \$2. Money Back Guarantee. Same as the best directories, except you receive within seven days or money back. Try Us! Sunshine Books, Dept. 40, Route 2, Box 698, Rustburg, Virginia 24588

GOVERNMENT SURPLUS. How and where to buy in your area. Complete Information \$2.00. DCI Sales, Box 1144, Salina, Kansas 67401.

JEeps . . . 499,999 other bargains!!! Inside track!!! Fully guaranteed directory. Government sources near you!!! \$1.75 today . . . Herb, 127 Lake Street, Englewood, N.J. 07631

GOVERNMENT BENEFITS

H-O-W T-O COLLECT TO \$112,501 GOVERNMENT BENEFITS OWED YOU!! — NEW REPORT!! — \$2.00 — MONEY-BACK GUARANTEE!! — "BENEFITS ADMINISTRATION," DEPARTMENT 894-B2, NATIONAL PRESS BUILDING, WASHINGTON, D.C. 20049.

VETERANS! DOES UNCLE SAM OWE YOU? "How To Get What U.S. Government Owes Veterans" Can Help You Find Out. \$3.00. The Mail Shack, 600 Welch Blvd., Dept. PM802, Flint, Michigan 48503

LOANS BY MAIL

BORROW FROM HOME. Any amount, any purpose, within 30 days. Competitive Rates. Also, you can earn unlimited income as our Money Agent. No experience—own hours. National Company to assist every way possible. No Gimmicks! Free Details: Financial, Dept. 10-C-2, 1145 Reservoir Avenue, Cranston, R.I. 02920

ARAB MONEY TO LOAN. Invest For Business, Investment Purposes. \$10,000 — \$10,000,000. FREE Details. Arab-PM, 935 Main, Vidor, TX 77662

GET Cash Grants—From Government. (Never Repay.) Also, Cash Loans. All Ages Eligible. Complete Information, \$2.00. (Refundable). Surplus Funds-PM, 1629 K Street, #502, Washington, D.C. 20006

BORROW \$25,000 "overnight." Any purpose. Keep indefinitely! Write: Success Research, Box 29263-AN, Indianapolis, Indiana 46229.

BORROW \$1,000-\$50,000 secretly—"overnight." Anyone! Credit unimportant. Repay anytime. Incredibly low interest. No interviews, collateral, co-signers. Unique "Financier's Plan." Full information, \$2 (refundable). Spectrum, 79 Wall St.-7, New York 10005

UNSECURED Loans \$4,000 Up. Details \$2.00. Fiesta-PLM, Springfield, Illinois 62708

FREE Details on How to Borrow up to \$10,000 entirely by Mail. Write: Postal Financial Services, Inc., Dept. 1381, 814 Pierce St., P. O. Box 266, Sioux City, Iowa 51102.

BORROW \$125,000 Interest-Free! Repay Anytime. Everyone eligible. Free Report: Executive PM-2, Box 990, Dundee, Florida 33838

CASH Loans and Outright Grants to Individuals refused Elsewhere. No Collateral, Co-signers, interviews. 96% Accepted. Associates, Box 98-A4, Brooklyn, NY 11235

SCASHS LOANS! Personal, Business, Consolidation. Any purpose. Write: NATIONAL, 507P Fifth Ave., New York 10017

PERSONAL

INFORMATION/Assistance on Anything. USA/— Worldwide: International Research Service, Box 225, Blue Bell, Pennsylvania 19422.

CUT GROCERY BUDGET INFLATION 15-60% WITHIN 60 DAYS. DETAILED MANUAL \$10.00. D-M Enterprises, Box 529, Manhattan, Illinois 60442

GOD'S MIRACLES ARE FREE. PAUL, BOX 2466, CLARKSBURG, WEST VIRGINIA 26301

HOW To Take Charge of your life — Inquire: Life Planning Institute, Box 2020, Breesport, New York 14816

COLLEGE DEGREES BY MAIL. Renowned Universities offer full-accredited Bachelors, Masters, PH.D's . . . Free revealing details. Counseling, Box 317-MP-2, Tustin, California 92680.

COLLEGE Diplomas Without Classes. Accredited Degrees by Mail. Free Details. DACS, Box 33428, Seattle, WA 98133

CONFIDENTIAL Chicago Mailing Address. Business, Personal Since 1944! Mail Center, 323(K) Franklin, Chicago 60606

FINANCE YOUR DREAMS With Government and Foundation Grants. Free details. Tou-PM2, 432 PCH, Hermosa Beach, California 90254.

MEN! WHERE ARE YOU? "What it Means To Be A Man". Profitable, Powerful, Guaranteed. Send \$2.00 to: SEECO, Oralman P.O. 212952000E, Salt Lake City 84106

IMPROVE Your Memory. Details Free: Memory, Box 77, Palco, Kansas, 67657.

DIVORCE. Beat the racket! Fight all discrimination! Literature, attorneys, information free. Please disseminate. MEN'S RIGHTS ASS'N., 8189, Forest Lake, Minn. 55025.

NERVOUS — Serenity Recipe, \$4.98. B. Gallo, Box 42903, Las Vegas, Nevada 89104

BIBLE Questions answered. Stamped envelope. Bylon, 17167 Bentler, Detroit, Michigan 48219

PSORIASIS SUFFERERS: DISCOURAGED: Write for Free important information that is helping thousands. Pixacol, Box 29277PM, Parma, Ohio 44129.

STARTLING . . . Life and Death facts about your **WOOD HEARTERS** . . . Writer: DPI, P. O. Box "F", Albemarle, N. C. 28001

SAVE ON YOUR INCOME TAXES WITH ULTIMATE TAX SHELTER Method of Super-rich in Special List of Legal Tax Deductions and procedures for business and personal returns. Send \$2.00 REFUNDABLE. Wilson's TRA, 706 West McGalliard, Muncie, Indiana 47303

HAY-FEVER SUFFERERS . . . Easy RELIEF without drugs—\$3. Spencer Enterprises, Box 111, Spencer, West Virginia 25276

A LIST OF ONE-Liners that will promote a friendly argument at any gathering. \$2.00. Specialized Works, P.O. Box 7751, Stockton, California 95201

REMAILING SERVICE

CONFIDENTIAL MAIL and PHONE Calls Received and Forwarded Daily. Central, Box 387PM, Claymont, DE 19703

PACIFIC Northwest Address. Discreet Remailing Service. Write: Jobal, Box 546, Woodinville, WA. 98072

TORONTO Remails - Confidential Service. Write: Williams, Box 835, Adelaide St., Toronto, Canada M5C 2K1.

VIRGIN ISLANDS MAIL SERVICE. Our exclusive address is yours. Prompt remailing forwarding. Inquire: St. Croix Island Company, Dept. 1, P.O. Box 1081, Frederiksted, St. Croix, U.S. Virgin Islands 00840

UNLISTED ADDRESS. Discreet and confidential. Remail 50¢ Single, Mail Forwarding Service, 8050 S. Main, Houston, Texas 77025

REMAILING DIRECTORY \$3.00. INTERNATIONAL REMAIL FORWARDING ASSOCIATION, BOX 1336M, HILO, HAWAII 96720

LETTERS Remailled and Forwarded. Details 25¢: Box 8, Buffalo, New York 14212

FREE! Remailers Listing. (New Agents Wanted): Box 471PM, Atlanta, Texas 75551.

BOSTON Remails, Stamped Singles 50¢. Jarman, 299 Nahant Road, Nahant, Mass. 01908

YOUR mail Received-Forwarded-Confidential. DAL Mail Service, P.O. Box 98, Southview Station, Binghamton, New York 13903

SUPERFAST, Confidential, Reliable, Economical 45¢. Webb's, Box 16369, Rocky River, OHIO 44116

NASHVILLE CONFIDENTIAL Personal businesses remailing, phone services. Prompt, dependable. Mailway, Box 24949PM, Nashville, TN. 37202.

NEW MEXICO Remails—Immediate re-mail 50¢. Anthony, 200 E. 22nd St., #44, Roswell, New Mexico 86201

MAIL RECEIVED — FORWARDED DAILY. Monmouth Management Associates, P.O. Box 401, Keansburg, New Jersey 07734

FLORIDA REMAILS Receiving-Forwarding. Allen, 6326 Autlan Drive, Jacksonville, Florida 32210

MISCELLANEOUS

QUALITY CERTIFICATES, serious, comic/sarcastic yourself, friends, live/\$3.00. Documents, 2022-A W. Cholla, Phoenix, AZ. 85029

PHOTO ID. Sealed in plastic. All states, provinces. 24-hours. GUARANTEED. Send \$5.00 (additional IDs \$4.00), photo, name, address, height, weight, hair, eyes, birthdate. CARDINAL, Box 5200-DR46, Jacksonville, Florida 32207.

TUBING: Vinyl, Latex, Neoprene, Colors; Catalogue: Canal Rubber Supply, 329 Canal Street, New York, New York 10013

IDENTIFICATION CARDS. Send for information. 929 University Ave., Berkeley, CA 94710.

AUTOMOBILE Drivers, Male-Female. Drive Late Model Cars, Pick-up Trucks all over the United States. Details \$5.00 plus self-addressed envelope with stamp. R.I.C., Box 583, Hancock, Michigan 49930

ORNAMENTAL Iron Designs. Book of 1600 Beautiful. Practical Designs for Railings, Columns, etc. Free Literature. Cunningham, 3881 South 3200 West, Box 20005, Salt Lake City, Utah 84120

PHOTO IDENTIFICATION CARDS . . . Certificates GUARANTEED!! Samples 25¢ . . . Basco, Box 3461-P-80, Providence, R.I. 02909.

FREE \$10.00 Surprise — \$2.00 Handling to: Box 841, Waterloo, Ontario N2J 4C3

HISTORICAL CASSETTE TAPE: "KENNEDY PRESIDENCY". Mail \$5.00. Tower, Lewes, Delaware 19958

WANTED—MISCELLANEOUS

BUYING Tungsten Carbide, Top Prices — Poley's Industrial Salvage, 12389 S. Mingos, Battle Creek, MI 49017 (616) 379-4075.

GOLD, Silver, Platinum, Mercury, Tantalum wanted. Ores assayed. Free circular. Wholesale Terminal, Norwood, Ma. 02062.

I BUY Old Fountain Pens. Evans, Box 1499, Santa Monica, California 90406

HEARING AIDS

HUGE SAVINGS. Eliminate dealer mark-ups. Free Trial. Batteries. Wholesale. Terms arranged. Lloyds-PMC, Rockford, Ill. 61104.

TRY before you buy! Rhodes Hearing Aids, 132-G, Brookport, ILL. 62910.

TOBACCO

MAKE Pipes. Information: Pimo, Inc., P20, Box 59211, Chicago, Illinois 60659

FORMULAS, PLANS, ETC.

ONE HUNDRED EASILY PREPARED PRODUCT FORMULAS. Rush \$1.00. Distributor, R7869, Milton, Florida 32570.

YOUR FORTUNE in Money-making Formulas! Thousands available at bargain prices—manufacturing secrets—easy money methods—details \$2.00 (Refundable)—GWAJ, Box 193, Brookfield, Wisconsin 53005

NEW MONEYMAKING FORMULAS! Catalog — \$1.00 — Refundable! — Innovel, Box 53, Custer, WA 98240

SPECIAL SERVICES

INFORMATION On anything. Ferguson Research Specialists, 60-15 Woodside, Woodside, New York 11377.

INFORMATION On Anything. Thorough, Reasonable, Fast! — Global Research Associates — PM, Box 182, Yalesville, Connecticut 06492.

PROFITS FROM CLASSIFIED ADVERTISING! Booklet shows you how to start your own business with Classified Advertising. Only \$1.00 (Refundable with first order.) H. E. KAPPEL, POPULAR MECHANICS, DEPT. P, 224 WEST 57TH STREET, NEW YORK, N.Y. 10019.

RESEARCH/INFORMATION any item, subject, service. Free details. Mailway, Box 24949PM, Nashville, TN. 37202

BETTER HEALTH

NEGATIVE ION GENERATORS and Accessories. (Assembled/Kits). (Fascinating details—\$1.00). Golden Enterprises, Box 1282-PM, Glendale, Arizona 85311

MEMORRHODS Cured permanently. Information free. Young, Box 9542-PM, Seattle, WA 98109

HOW To Stop Smoking! Secret Reveals All you Need to Know to Do-It-Yourself. Send \$3.95. Ashton's, Dept. 3, Box 2218, Pasco, Washington 99302

SMOKING? Stop! Tested Detailed Booklet \$3.95. Money Back Guarantee. Parkhurst Associates, United Penn Bank, Wilkes Barre, PA. 18701

STOP SMOKING WITHOUT GAINING WEIGHT! 32 page Book \$2.00. Bailey Morgan, Box 654, Windsor Locks, CT 06096

FLOWERS, PLANTS & NURSERY SUPPLIES

LEARN Flower Arranging and Floristry. Start business or hobby. Free information on home study course. Lifetime Career Schools, Dept. B-584, 2251 Barry Avenue, Los Angeles, California 90064

GROW Ginseng! \$50 Pound. Have Seeds, Roots. Goldenseal. Full information. K. Collins, Viola, Iowa 52350

LEARN Landscaping at home. Free booklet. Lifetime Career Schools, Dept. A-794, 2251 Barry Avenue, Los Angeles, California 90064

PARSHIP Seed Sale. \$1.15 Each. Postpaid. SASE. O. Thorpe, P.O. Box 415, Ellensburg, Washington 98926

WINEMAKING & OTHER RECIPES

WINEMAKERS-BEERMAKERS Free Supply catalog. Yeast. Equipment. Continental, Box 68016-PM, Indianapolis, Ind. 46268.

HOME Practice of the Brewers Art. Send \$4.00 To: Spectro Services Corporation, P.O. Box 9386, Norfolk, VA 23505

MR. FRANK'S RECIPES for King Crab Legs and Breaded Fan-Tailed Shrimp. Send \$2.00 to: FRANK'S STEAK HOUSE, P.O. Box 703, Niagara Falls, N.Y. 14302.

WINEMAKERS -Beer makers; Free illustrated catalog of supplies. Simplex, Box 12276R, Minneapolis, Minnesota 55412.

MAKE BEER. Wine, Liqueurs. Free Catalog. Bacchanalia, Box 1PM, Dartmouth, MA 02714

WINEMAKERS-BEERMAKERS—Free Catalog—Fast Service—Large Selections: Kraus, Box 7850L, Independence, Missouri 64053.

BEERMAKERS. Winemakers. Free Catalog. Recipe. Finest Ingredients, Equipment, Service. SPI, Box 784M, Chapel Hill, North Carolina 27514

BEERLOVERS! Brew American and European Beer. Complete Kits. Equipment. Supplies. FREE Details. Duane Imports Ltd., Department PM20A, 508 Canal Street, New York, New York 10013

BACHELORS' Cookbook. 100 quick, economical recipes for fish, beef, pork, poultry. \$3.50 and self-addressed envelope. M. Hale, P.O. Box 18347, Wichita, Kansas 67218

SAVORY MESQUITE SMOKED RANGE BEE — Absolutely Delicious. Your Friends Will Envy You — Fact, No Brag! Directions, Recipe, Mesquite \$3.00. Warnke Ranch Ent., 8034 Antoine, 108PM, Houston, Texas 77068

MOM'S Dollar Saving Recipes. \$3.00. Large SASE. Delightful Products, P.O. Box 567A, Sunnymead, California 92388

WINEMAKING/BEERMAKING Supplies, Equipment. Free Catalog. Wine Hobby, P.O. Box G-104, Greenwood, MA 01830.

EVERYTHING For Wine, Beer, Catalog: Jim Dandy Sales, Box 30377P, Cincinnati, Ohio, 45230

BLEND OF WINES — Unique Recipe — Fantastic Tasting — All Occasions — \$2.00. M.N.C., Box 38, Elwyn, PA 19063

FREE RECIPES — BEER, WINE. Make Better Beer at Home than you can Buy. Also Excellent Wine. Have Fun—Save Money. The Winery, Dept. M, 60 South Cooper, Memphis, TN 38104

BEER-WINEMAKING Supplies. 38 Imported Melts Free Catalog. Wine & Brew Hobby, P.O. Box 1866, Allentown, Pa. 18105

"LIQUEURS/HOR D'OUVER" Eight Popular Liqueurs \$3.50. Do ahead hor d'ouvers Famous Cooking School Recipes \$3.00/Box 3041, La Jolla, California 92038.

CHAMPAGNE. Connoisseur's Delight. Homemade, Sparkling, Citrus. Recipe \$1. Draxx, Box 4404, Charleston, WV 25304.

BREW Your Own Beer! Instruction and recipe \$1.00. Satellite Shopper, 5702 W. Ridgeway, Houston, Texas. 77053

TWELVE Favorite Recipes \$3.00. Old Fashion Recipes, RT.4, Box 195, Winchester, Virginia 22601

FREE ENCYCLOPEDIA Winemaking, Beer-making, Supplies, Equipment, Ingredients. Vynox Industries, Box PM7498, Rochester, New York 14615

BEER LOVERS — Brew your own. Delicious! Inexpensive! Free Catalog. Beer Gear, Box 25093M, Lansing, Michigan 48909

ELEVEN delicious Peanut Butter Recipes! \$3.00 SASE. Carole, Box 991-HSJ, Springfield, Missouri 65801

LIQUEURS, 6 You Make — \$3.50. Sweet Mel's, Box 9002, Boise, ID 83707

MOONSHINE! Whiskey, Gin, Vodka Making. Illustrated Manual, Recipes, \$2.00. Gourmay, 5133 Fairhill, Philadelphia, PA 19120.

DELICIOUS CHOCOLATE PIE RECIPE. Original \$3.00. Marge Smith, 1531 Northwest 29 Street, Oklahoma City, Oklahoma 73106

WINEMAKING —Using Balloon Fruit Juice Jugs—Recipe \$2.00 Blackett, 562-31 St., Ogden, Utah 84403

OLD FASHIONED RECIPES —Clam Chowder, Chicken Soup—\$2.00 each. P.O. Box 63-4703, Margate, Florida 33063

EXCELLENT!! Old-world Recipe using inexpensive Chuck Roast. Superb House Specialty for the Restaurateur or Family Gourmet. \$3.00. SASE. Hilltop Enterprises, Box 1363, Granite City, Illinois 62040

BURGLAR ALARMS & HOME PROTECTION

PROFESSIONAL EQUIPMENT. Compare Prices!!! Catalog/Decals — \$1.00. (Refundable). Preventor, 5602PF Santa Anita, Arcadia, 91006

POLICE DIALER \$29.95. Free Catalog. SASCO, 5619 St. John, Kansas City, Mo. 64123

BURGLARY VICTIMS: NEVER AGAIN! Learn "How to Repel Burglars" \$2.00. Prevention, Box 3151C, Culver City, CA 90230

ULTRASONIC - Wireless - Perimeter. Quality Selection. Catalog \$1. EAC, Box 7881J, Colorado Springs, Colorado 80933

Popular Mechanics

224 West 57th Street, New York, N.Y. 10019
Classified Advertising Dept. (212) 262-4825

Order Form

DEADLINE FOR ADS: Copy and Payment must be in by the 5th day of the 2nd preceding month for the issue in which the ad is to appear. See Head of Classified Section.

HOW TO COUNT WORDS: Name and address must be included in counting the number of words in your ad. Each initial or number used counts as 1 word: H.E.Kappel, 224 West 57th Street, New York, New York 10019: 9 WORDS. Zip codes are not counted. Phone #: 2 Words. Symbols used as keys are charged for. City or State count as 1 word each.: New Brunswick, New Jersey: 2 Words. Abbreviations such as C.O.D., F.O.B., R.P.M., U.S.A., P.O., 5x7, 16mm are counted as 1 word. (P.O.Box 392 counted as 3 words) Webster's International Unabridged Dictionary will be used as our authority for spelling, compound words, Hyphenations, abbreviations, etc. Please make checks payable to **POPULAR MECHANICS**.

Remittance of \$_____ is enclosed to cover _____ insertion(s) in the _____ issue(s) _____ Classification

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32

YOUR NAME _____ PHONE: _____

FIRM (NAME IN AD) _____ (PLEASE PRINT)

YOUR ADDRESS _____

CITY _____ STATE _____ ZIP _____

DATE: _____ YOUR SIGNATURE _____

(PLEASE PRINT OR TYPE COPY • FOR ADDITIONAL WORDS ATTACH SEPARATE SHEET)

Subscription price Slashed to \$2.97!

Moneysworth monthly has stunned the magazine world by announcing an offer of full-year subscriptions for just \$2.97. This is as little as some magazines charge for a single issue.

"We're doing this to celebrate our Tenth Anniversary," a spokesman said, "and to solidify Moneysworth's position as America's Number One Biggest Publishing Bargain. Ever since it began publication in 1970, Moneysworth has consistently lowered subscription rates, while other periodicals have raised theirs. We started out at \$10 a year and now we are offering Tenth Anniversary Special Subscriptions at *THE UNREAL PRICE OF ONLY \$2.97!*"

Moneysworth, which tells how to get the most for your money and the most out of life, is read by an estimated 5,000,000. Its chief competitors are Consumer Reports, which sells for \$12 a year, and Money magazine, for \$14.95.

How to place your order

Readers of this magazine who wish to take advantage of this unparalleled offer should send their name and address along with \$2.97 to: Tenth Anniversary Special Subscriptions, Moneysworth, 251 W. 57th Street, New York, NY 10019.

Typical of the savvy, wallet-fattening articles Moneysworth prints are these:

Recession-Proof Jobs

Cars that Are Stingiest with Gas

How to Earn 10½% on Your Savings

Canada's FREE Land Giveaway

How to Qualify for Food Stamps

The Only Diet that Really Works

The Long and Short of Hair Transplants

How to Collect Social Security from the

U.S. and Canada—BOTH

Are Hay Fever Shots Pointless?

Mercedes' New "Lifetime" Car

How to Reduce Exorbitant Doctor Bills

States with Best Unemployment Pay

How to Get a Low-Cost Divorce

The Kinds of Cars Mechanics Own

How to Hold On to Your Auto Insurance

How to Turn Bortops into Gold

Contact Lenses that CURE Poor Vision

Happiness Is a Hick Town

A Gourmet's Guide to Free Cookbooks

How to Stop Snoring

Air Travel at 50% Off

Today's Soldiers Command High Pay

Prosperity in Alaska

Low-Cost Insurance for Non-Smokers

Mattresses to Turn Handsprings Over

How to Save 20% on Your Food Bill

Scholar Dollars for the Middle Class

Where Retirement \$\$ Goes Farthest

The "Yurt": Incredible \$350 House

How to Get 7 Bestsellers for Price of 1

Ski Areas Without Steep Prices

How to Burn Wood Efficiently as Fuel

Resumes that Get Jobs

How to Avoid Alimony

How to Travel and Get Paid for It

Fifteen Fabulous Free Maps

Don't Sneeze at This Cold Remedy

Starting a Retirement Business

Videotape: The Last Word in Wills

The World's 100 Best Free Calendars

Landing an Executive Job After 40

How to Cope with Dunning Letters

Sailboats that Are Real Winners

Getting a Job as a Forest Ranger

The Amazing New Two-Engine Car

As you can see, Moneysworth is an easy-to-follow instruction manual for building a better life. Each day, it is inundated with ecstatic testimonials like:

• "You're not going to believe this, but I have parlayed \$146 into \$90,000, due to your informative article on how to break into real estate. How can I ever express my gratitude sufficiently?"

—H.T. Pinrose; Montgomery, Iowa.

• "Your advice on Social Security resulted in a \$3,135 lump-sum cash payment to my wife and \$171 monthly pension. The best investment I ever made was my subscription to Moneysworth." —Dr. Herman Hortop; La Grange, Ill.

• "Your tip on flying to Europe via Afghanistan saved me \$450. You've made me a subscriber for life." —Charles B. Fager, M.D.; Harrisburg, Pa.

• "Your article on high interest paid by foreign banks has enabled me to retire in style. I cannot thank you enough." —E. Svenson; Fallbrook, Cal.

• "Your news reports on investments have brought me, in just months, \$12,996 profit, tripling my money. You can bet I'll be a Moneysworth subscriber for life." —L. Grey; Ypsilanti, Mich.

• "Your article 'Inaccurate Billing by the Phone Company' led me to discover four years of overcharges. I got a \$1,593 refund!" —A. DiRienzo; Bristol, Pa.

• "Moneysworth's product ratings sure stretch the dollar. I bought the 35mm camera you recommended, saving 30%." —R. Goodrich; Tucson, Ariz.

• "Your article 'How to Avoid Paying an Exorbitant Doctor Bill' saved me \$65. Here's my subscription extension." —C. Wagner; Yorktown Heights, N.Y.

• "Thanks to your article 'How to Buy a New Car for \$125 over DEALER's Cost,' I just bought a Chevy at a saving that I conservatively estimate at \$350." —Rudy L. Grange; Anita, Iowa.

• "Moneysworth is aptly named. To paraphrase Churchill, never have so many paid so little for so much." —Dave Alpern; Pittsburgh, Pa.

To take advantage

To take advantage of this *GIVEAWAY* offer, readers of this magazine should send their name and address with \$2.97 to: Tenth Anniversary Special Subscriptions, Moneysworth, 251 W. 57th Street, New York, NY 10019.

If ever a publication was accurately named, it's Moneysworth. This offer is highly recommended.

HOW MUCH FISHING CAN HOMER CIRCLE DO WITH EVINRUDE'S NEW 7½ AND 5 GALLONS OF FUEL?

NOTE FROM EVINRUDE: Miles per gallon and gallons per hour figures are fine for boat testers and engineers. But they don't mean much to ordinary troll-and-search, stop-and-cast fishermen. So we invited noted fishing writer Homer Circle, Angling Editor of Sports Afield, to run the 7½ for a week — doing what he would typically do fishing an unfamiliar lake — and report on what he did and how much fuel he used.* His report follows:

"It takes a heap of running to find fish during dog-day doldrums. And this was the challenge we faced when invited to 'wring out' Evinrude's new 7½ hp outboard.

"A week's fishing on less than a gallon of fuel a day? The way I fish, without the help of an electric motor? Frankly, I doubted it. Maybe four, but surely not six days.

"Gayle, my 'childbride' of 42 years, and I have fished together over three continents, and rarely have we found the fishing tougher.

"Using a topographic map of Wisconsin's Namekagon Lake, we systematically sought out bottom structures using a sonar flasher. We did not skimp on fuel but probed as we normally would under such conditions.

"We fished as we did 25 years BE, before electrics. We either let a friendly breeze waft us along an area, or anchored to fish out select spots, or trolled from one point to another.

"To catch enough fish to eat, we had to hit it hard to ferret out four holding areas from one to four miles from the dock. Then, putting aside



thoughts of fuel frugality, we deep-trolled during midday hours seeking a suspended lunger.

"Not only did we use just 5 gallons of gas during the week, we experienced the flawless performance of a thoroughbred. It powered our 14-foot Alumacraft from flat to seat in seconds.

"I found especially handy two features at the tip of the control handle: a kill button, and a knurled ring to fine-tune idling.

"Only on three occasions did this motor fail to start on the first pull. All were my fault for forgetting to put the handle control on 'start.' I liked the dock manager's comment: 'Sounds like my mother's sewing machine.'

"Summarizing: we put Evinrude's new baby to the test and found it totally adequate to all our fishing needs. In short: it's a gas-hoarding honey!"

**Of course, your fuel consumption will depend on conditions and your use of the outboard.*

EVINRUDE 
Product Group Outboard Marine Corporation **first in outboards**
©Outboard Marine Corporation 1979. All rights reserved.



16 mg. "tar", 1.1 mg. nicotine av. per cigarette. FTC Report MAR 78.

© 1978 Camel & Co., Inc. All rights reserved.

Satisfaction, Camel Filters style.

Some men taste it all: Rich warm flavor. Smooth even taste. Solid satisfaction.

Only from the Camel Filters blend of Turkish and domestic tobaccos.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

